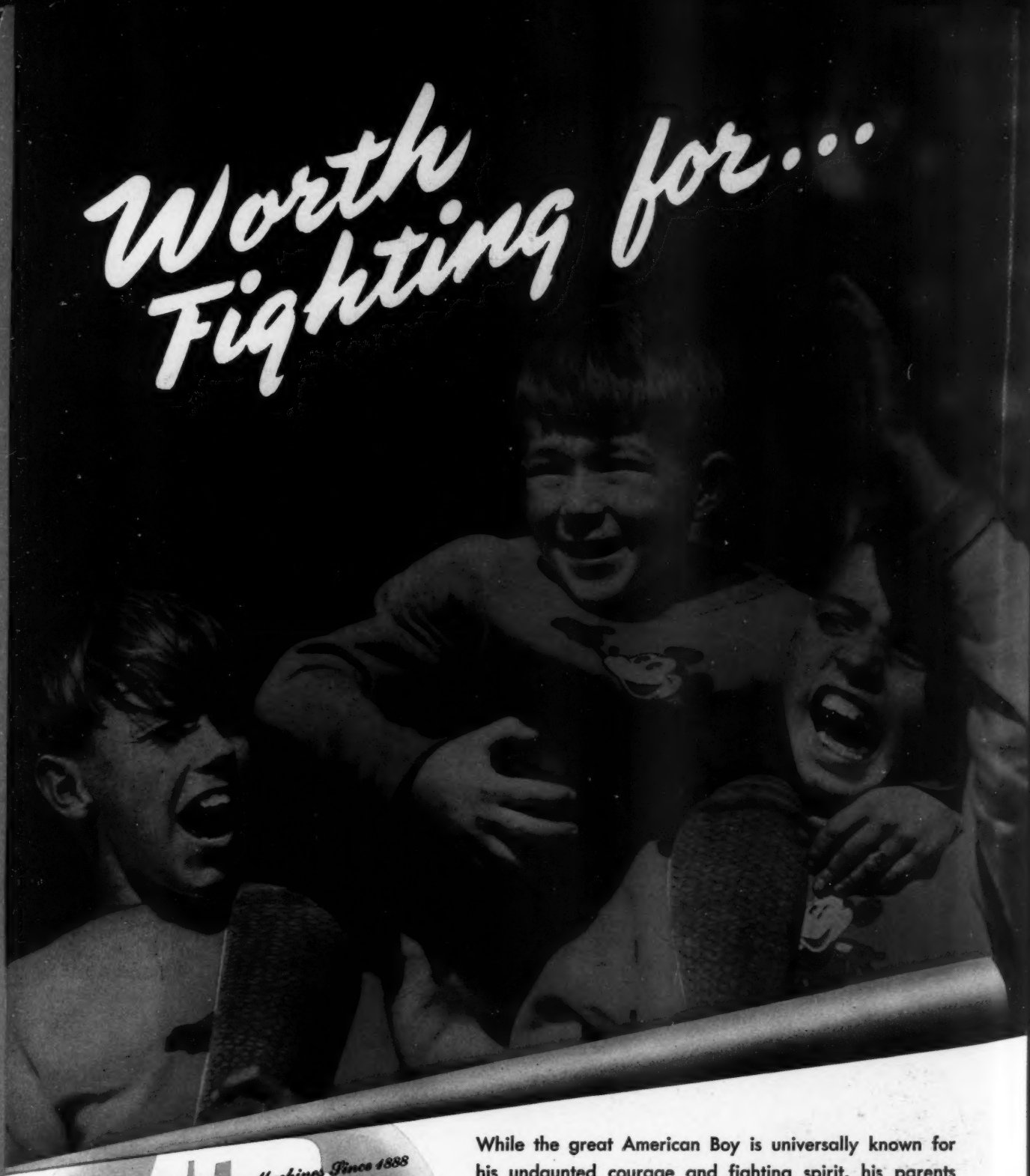
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

DETROIT

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

NOVEMBER, 1943

VOL. 32, No. 9



Precision Built Milling Machines Since 1888

KEMPSMITH

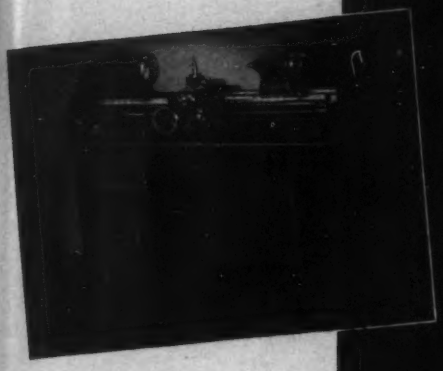
KEMPSMITH MACHINE COMPANY • MILWAUKEE 14, WIS., U. S. A.

While the great American Boy is universally known for his undaunted courage and fighting spirit, his parents naturally prefer to have him fight on the gridiron, instead of on the battlefield. To afford such opportunity, however, the present devastating War must first be won. All of us should concentrate our energies in that direction . . . work diligently and willingly . . .

STAY ON THE JOB!

A-4225-1PB-C

New Workers are Quickly Trained ON SOUTH BEND LATHES



9" swing, South Bend Engine Lathe

It is now recognized that the United States, as the principal arsenal of the Allied Nations, must continue to turn out munitions in ever increasing quantities. If the established production goals are to be attained, thousands of non-essential workers must be trained quickly for war production jobs.

Pre-employment training for new workers can be completed in a minimum of time when South Bend Lathes are used. Carefully designed for simplicity and ease of operation, these lathes have no unnecessary gadgets or intricate controls to confuse the beginner. Their smooth, quiet operation allays the nervousness often caused by the noise of ordinary machinery.

Because South Bend Lathes are so widely employed for war production work, their use for training purposes also saves on-the-job training time. The amount of individual coaching and supervision required to get new workers started is appreciably reduced when they are familiar with their machines.

There is a South Bend Lathe for most training requirements. Write for a copy of Catalog 100C in which they are all described.

TEACHING HELPS
for Shop Classes

South Bend teaching helps—books, sound films, wall charts, and bulletins on the care and operation of a lathe—are available for school shop instruction. Write for Bulletin No. 21-C.

★ BUY WAR BONDS ★

SOUTH BEND LATHE WORKS
LATHE BUILDERS FOR 37 YEARS SOUTH BEND 22, INDIANA

Students in a school Graphic Arts department working at Hamilton Type Cabinets and Imposing Table

The POWER of the Printed Word

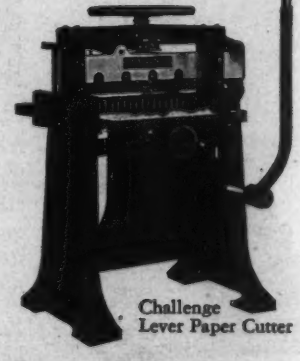
Vandercook Precision Proof Press

• Trends in Education give more and more emphasis to school shop and laboratory values.

The Printed Word has been and is the greatest morale builder of all time!

• A Printing Department in your school can serve as a powerful publicity medium—under school control—to keep community taxpayers informed about educational trends in your school program.

• For over twenty-five years school executives and teachers have turned to ATF's Department of Education for advice and assistance in organizing their Graphic Arts programs. This advice is yours for the asking, *without obligation.* Write to

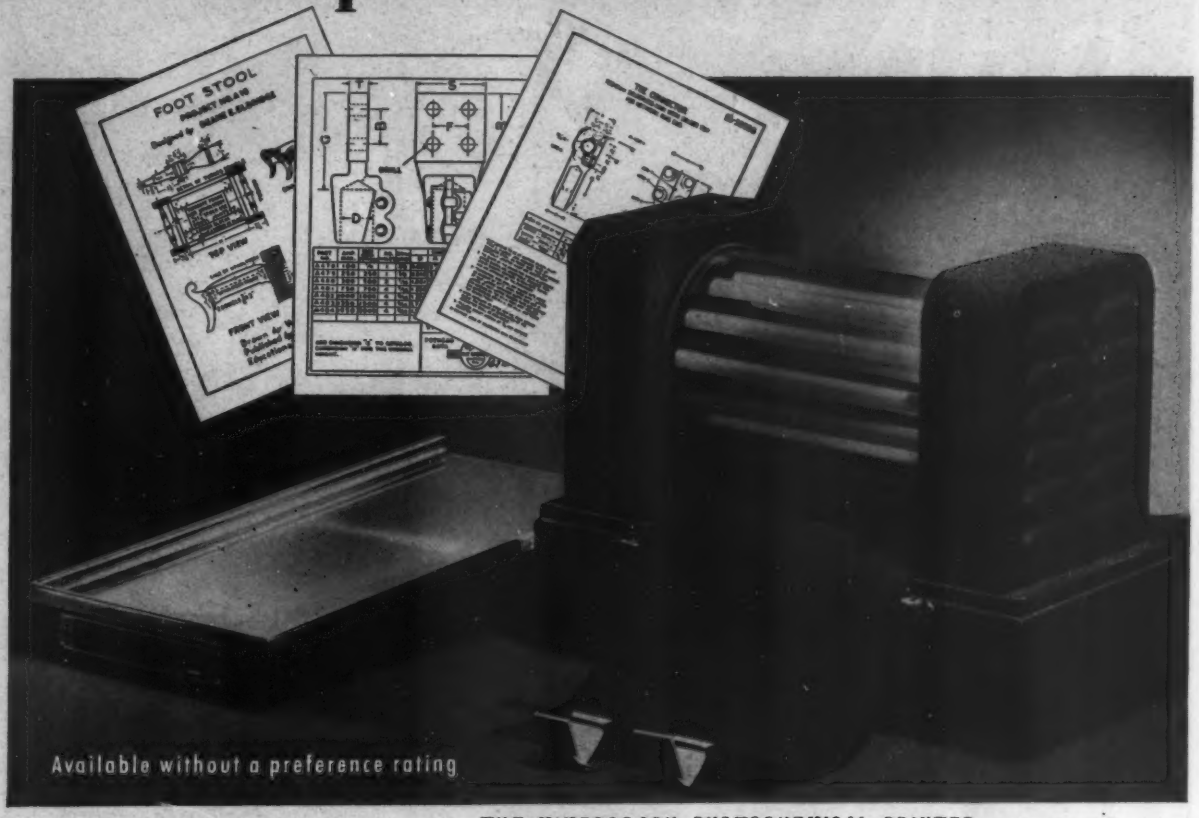


Challenge Lever Paper Cutter

American Type Founders · Department of Education

200 ELMORA AVENUE, ELIZABETH 3, N. J. BRANCHES IN TWENTY-THREE CITIES

Here's Help for Vocational Instructors



***THE MIMEOGRAPH PHOTOCHEMICAL PRINTER** produces project drawings in quantity at low cost*

Vocational instructors struggling under the burden of larger classes and changing enrollments, have found a remarkable new teaching help in the Mimeograph photochemical printer, supplement equipment to the Mimeograph duplicator.

What it is . . .

This basic equipment for vocational education provides a new method of making duplicate copies of ink tracings in large or small quantity—and at very small cost.

How it works . . .

The Mimeograph photochemical printer transfers an ink drawing to a duplicating medium in a single step.

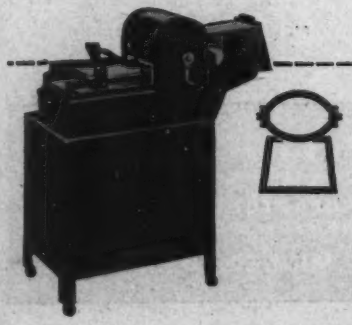
It does it by exposing the ink tracing, on tracing cloth or paper, and a sensitized Mimeograph photochemical stencil sheet to a new type of brilliant light source.

The completed stencil is placed on the Mimeograph duplicator and dozens, hundreds, or thousands of clear, black and white copies can be produced as they are required.

What it means . . .

With this economical new duplicating method every pupil can have his own copy of project drawings and other important visual materials. Instruction even in very large classes becomes individualized. Efficiency levels are stepped up. Routine is eased and the strain on teachers lightened.

Find out now the full details of how the Mimeograph photochemical printer can help you in your important work. Send coupon below to A. B. DICK COMPANY, Chicago.



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Send me full information on the Mimeograph photochemical printer.

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9 Times Faster THAN HAND FILING

For internal *file broaching* the band is opened, inserted through the work and snapped together in only a few seconds.

DoALL Band Filer with motor and all moving parts fully enclosed occupies less than 2½ x 3 feet of space.

An hour's filing job done in six or seven minutes because, with DoALL, filing is merely a matter of *feeding the work!* Metal is removed in clean cut, curved chips constantly while the work is fed against the endless band of precision fit, interlocked, file segments.

New accuracy too! Positive controls of work and file speed permit filing to "die-fit" tolerances—smooth machined finishes—by relatively inexperienced operators.

Investigate the vastly greater efficiency of DoALL Band Filing—in production, tooling or maintenance work—on all metals from tool steel to soft brass and wood, fibre and plastics, too! Telephone your nearest DoALL Sales Office—now!

FREE: Bring or send your filing problem for a complete time-and-method study—*the* DoALL *way.*

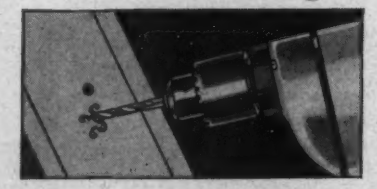
SALES OFFICES IN 34 PRINCIPAL CITIES

BAND FILER IS MANUFACTURED BY CONTINENTAL MACHINES, INC.

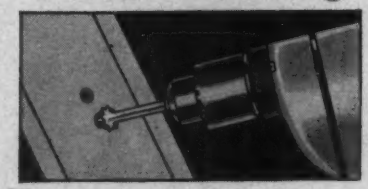
ADDRESS INQUIRIES TO 1301 WASHINGTON AVE., SOUTH, MINNEAPOLIS, MINN.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, November, 1943, Volume 32, No. 9. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee 1, Wis. Entered January 2, 1914, as Second-Class matter at Milwaukee 1, Wis., under Act of March 3, 1879. Subscriptions — U. S., $2.50 per year. Canada and Foreign, $3.00. Single copies, 35 cents.

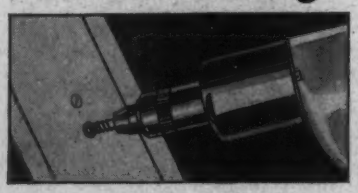
for Drilling



Countersinking



Screwdriving



BLACK & DECKER'S Holgun and Scrugun—that's industry's top-choice team for countless assembly operations in wood, metal, plastics and other materials. So that's the team for training! Holguns for drilling and countersinking . . . Scruguns for driving wood screws, self-tapping screws, machine screws and nuts. Each is a light, compact "Handful of Power" . . . with the famous Pistol Grip and Trigger Switch.

Industrial schools and shops standardize on Black & Decker Portable Electric Tools because they are so widely used, throughout every branch of American industry. So it's best to have students *learn* now on the same tools with which they'll *earn* later. Your nearby Black & Decker Distributor will be glad to help you choose the right tools for your training program.

LESSONS IN INGENUITY—FREE

If you haven't received our booklet—"They Used Their Heads"—write for a free copy. It shows how ingenious production men have combined brains with Black & Decker Tools to solve difficult production problems. Teachers will find it especially helpful and informative. Address: The Black & Decker Mfg. Co., 780 Pennsylvania Ave., Towson 4, Maryland.

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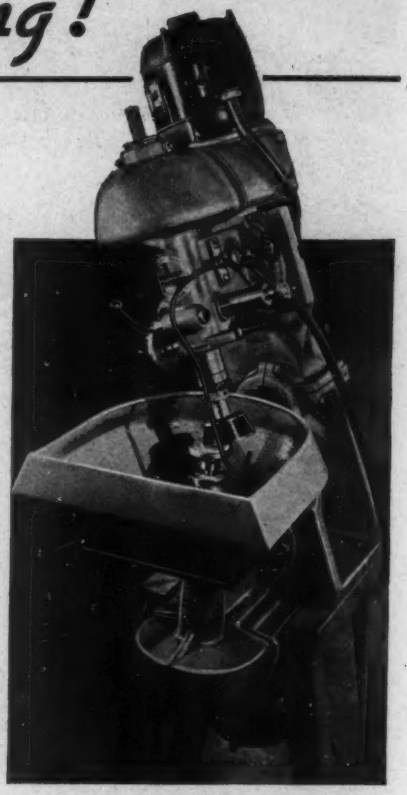
PORTABLE ELECTRIC TOOLS

THE MORE VERSATILE THE MACHINE *the Better the Training!*



● Because of their unusually broad range of speeds, Walker-Turner Machine Tools are being used on a wide variety of operations in war-time industry. A few are shown here.

● This versatility is important to your vocational program for two reasons: 1. It gives you greater scope in selecting projects. 2. Since these units cover a wide field in industry, your students will encounter them frequently after graduation.

● Walker-Turner Machine Tools are easy to operate; simple to understand; ruggedly built to stand up under long hours of inexperienced handling; fully safeguarded; priced to fit your school budget. Send for latest catalog.

WALKER-TURNER COMPANY, INC.,
19113 Berckman Street, Plainfield, N. J.

(*Lower left*) Cutting Plexiglas Bomber Noses at Rohm & Haas plant. Many war plants use these versatile Metal-Cutting Band Saws to relieve overworked heavier machines at congested spots.

(*Lower right*) Small diameter holes (up to ½"), a large area to be covered and a heavy, cumbersome jig, makes an ideal set-up for a Walker-Turner Radial Drill at the Lewyt Metal Products plant.

(*Upper*) Using two Walker-Turner Drill Heads assembled in an automatic machine, William Mogey & Sons, manufacturers of precision optics, cut a rough grinding operation from 10 minutes to 30 seconds.

walker-Turner
COMPANY, INC.
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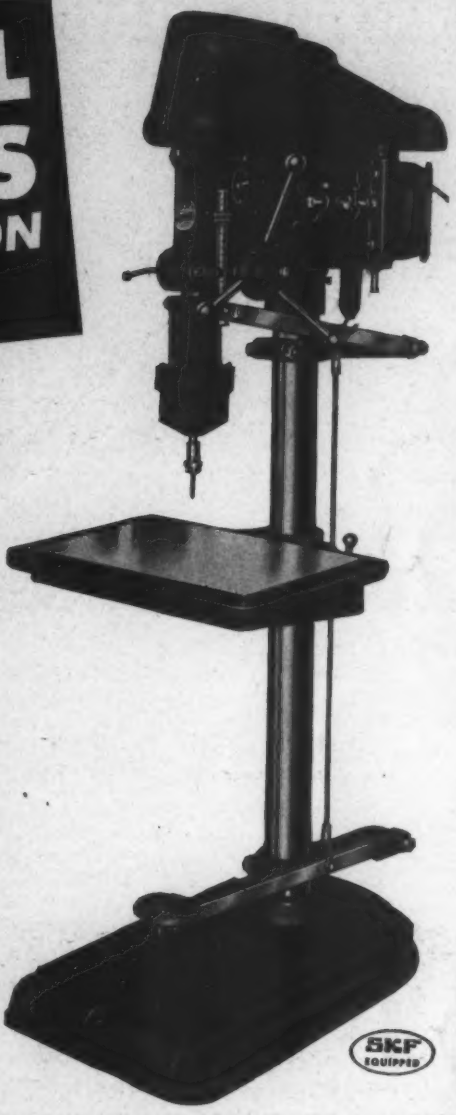
MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Atlas DRILL PRESS
WITH WAR PRODUCTION ATTACHMENTS



Wherever there are holes to be drilled — in thousands of war plants or with the mobile machine shops of our armed forces — Atlas Drill Presses are setting great efficiency and precision records. If your program includes training in production drilling and tapping, write for full details on the Atlas No. 73 heavy-duty drill press equipped as shown. It's a natural for training because it's tops for production!

ATLAS PRESS CO.
1171 N. PITCHER ST., KALAMAZOO 13D, MICHIGAN

DECIMAL EQUIVALENTS
THE MODERN BACK GEARED SCREW CUTTING LATHE
A.S.M.E. V TYPE THREAD DIMENSIONS
THREAD FORMS AND FORMULAS
LATHE CUTTING TOOLS

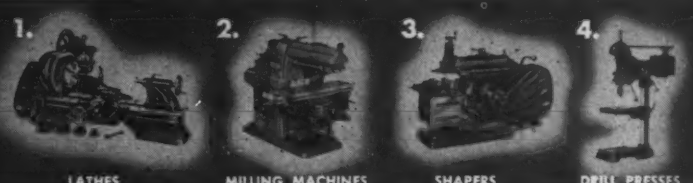
WALL CHARTS

Large easy-to-read charts with up-to-date technical information on a variety of subjects. The largest chart is 35½" x 25½", others 16" x 21". Complete set of five charts sent postpaid for $0.25 per set.

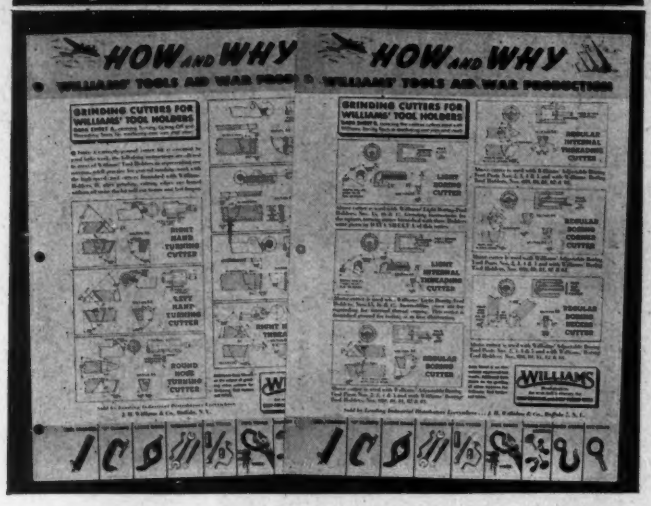
CONDENSED SPECIFICATIONS

Drills to Center of Circle	15" diam.
Maximum Distance, table to chuck	40½"
Maximum Distance, table to tapping attachment	37½"
Chuck Capacity	½"
Oil Table	10½" x 16½"
Spindle Travel	4"
Overall	16½" x 30" x 72" high

Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING



HOW TO GRIND CUTTERS FOR WILLIAMS' TOOL HOLDERS



FREE! WILLIAM'S TOOL DATA SHEETS

● These two Williams' Tool Data Sheets graphically explain how to grind cutters — give correct included angles, clearances and rakes. Also instructions for set-up and use. Other Data Sheets are listed below. Circle the number of those desired on coupon and mail today. They're punched for 3-ring binder.

1. Characteristics of Williams' "Superior" Wrenches.
2. Data on Williams' Boring Tools.
3. Data on "Vulcan" Chain Pipe Tongs.
4. Data on Williams' "Supersocket" Wrenches.
5. Data on "Vulcan" Lathe Dogs.
6. Data on "Vulcan" Chain Pipe Vises.
7. Data on Williams' Turning-Tools
8. Data on Williams' "Superior" Wrenches.
9. Saving Time with Williams' "Supersockets".
10. Data on "Vulcan" Eye Bolts.
11. Data on Williams' "C" Clamps.
12. Use of Williams' Cutting-off Tool Holders.
13. Use of Williams' Knurling Tool Holders.
14. Use of Williams' Threading Tool Holders.
15. Internal Threading with Williams' Tools.
16. How to Grind Cutters for Williams' Tool Holders. Sheet A.
17. How to Grind Cutters for Williams' Tool Holders. Sheet B.

MAIL THIS COUPON

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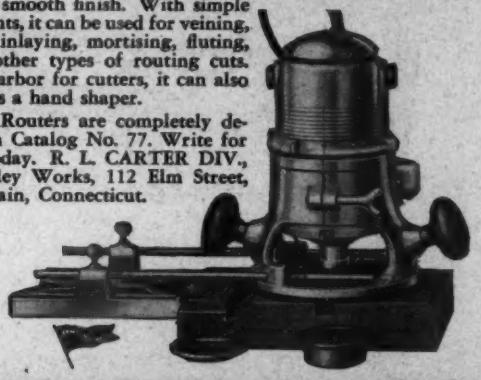
SUPERIOR DROP-FORGED TOOLS

Teach ROUTING to Industrial Trainees with CARTER PORTABLE ROUTERS

Wood workers being trained for industry should be taught the time-saving advantages of Routers for recessing and trimming cuts that are hard, slow work with other tools.

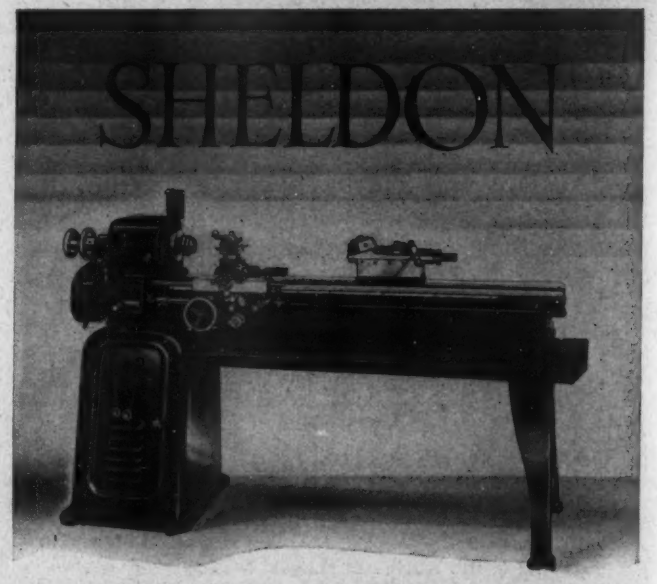
Carter Portable Routers provide inexpensive equipment for demonstrating such operations, more widely used than ever in industry today. The R5A (illustrated) is light and easy to handle, yet has ample power (1 H.P.) for fast cutting in wood, plastics, or non-ferrous metals. Its high speed (18,000 R.P.M.) assures a smooth finish. With simple attachments, it can be used for veining, beading, inlaying, mortising, fluting, and all other types of routing cuts. With an arbor for cutters, it can also be used as a hand shaper.

Carter Routers are completely described in Catalog No. 77. Write for a copy today. R. L. CARTER DIV., The Stanley Works, 112 Elm Street, New Britain, Connecticut.



No. R5A Carter Portable Router

CARTER TIME-SAVING TOOLS



PRECISION TOOL ROOM AND PRODUCTION LATHES

BEST known as quality tool room lathes, SHELDON Precision Lathes are also ideally suited for much second operation and other production work because of their extra collet capacity, sturdy construction, accuracy and available production features including: Lever operated Bed Turret, or Tool Post Turrets, Lever operated Collet Attachments, Tailstocks, Double Tool Posts, 4-speed underneath motor drives, etc. If you are looking for a 10", 11" or 12" Precision Lathe for the Tool Room or Production Line, be sure to see the SHELDON Lathe before you order.

SHELDON MACHINE COMPANY, INC.
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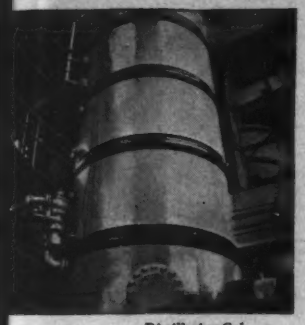
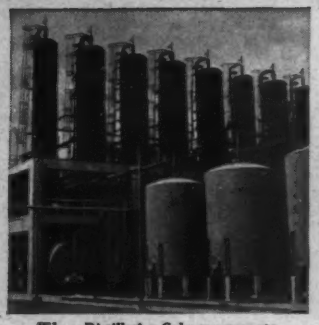
TEN YEARS' WORK IN TWO

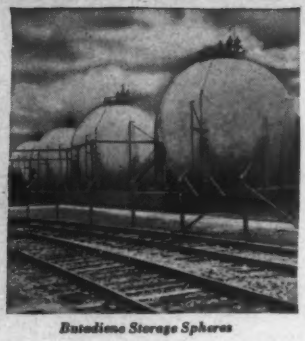
is the story behind Butadiene and Styrene for Synthetic Rubber



Distillation Column for Styrene



Where Distillation Columns separate and purify the Butadiene



Butadiene Storage Spheres

WE WISH YOU could see the first of the Government's large integrated synthetic rubber projects, complete at one location. What you see here is a night scene and some daytime views of the immense butadiene and styrene plants that CARBIDE AND CARBON CHEMICALS CORPORATION, a Unit of UCC, has designed and built at Institute, West Virginia, for the Government's Defense Plant Corporation and is operating for the Rubber Reserve Company.

Carbide and Carbon also has completed another butadiene plant at Louisville, Kentucky —and has released plans to Koppers United Company for a third butadiene plant near Pittsburgh, Pennsylvania.

Butadiene had never been manufactured in the United States in large quantities before the plants at Institute went into production. The task involved in providing the mass production facilities the Government asked for was an unusual one...but one that took full advantage of the experience and processes developed by Carbide and Carbon.

Generally, it requires seven to ten years for a company to take a process developed in the laboratory, put that process to test in a pilot plant, iron out production problems, design a full-size plant, and then actually build the plant and go into mass production.

By working at top speed for twenty months —Carbide and Carbon telescoped research, development, engineering, and construction work that would have taken 10 years in normal times. In this short time laboratory research was translated through chemical engineering into larger and more modern facilities for producing the chemicals for synthetic rubber than existed anywhere else in the world.

This achievement could never have been possible had it not been for the years of research and experimentation which, prior to the emergency, Carbide and Carbon had devoted to the production of synthetic—or man-made—chemicals of the organic series.

Business men, technicians, teachers, and others are invited to send for the book "Butadiene and Styrene for Buna S Synthetic Rubber from Grain Alcohol" which explains what these plants do, and what their place is in the Government's rubber program.

• • •

BUTADIENE, (bew-ta-dī'-een). A highly volatile liquid which is the principal chemical in the manufacture of Buna synthetic rubbers.

STYRENE, (stī'-reen). A liquid, like benzene, but having the property of reacting within itself to form a solid, clear, plastic mass. It is used as one of the principal ingredients of Buna S synthetic rubber.

BUY UNITED STATES WAR BONDS AND STAMPS

UNION CARBIDE AND CARBON CORPORATION
30 East 42nd Street UCC New York 17, N. Y.

Principal Products and Units in the United States

ALLOYS AND METALS
Electro Metallurgical Company
Haynes Stellite Company
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National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS: Bakelite Corporation • Plastics Division of Carbide and Carbon Chemicals Corporation

CONSTRUCTION RECORD AT INSTITUTE

June 25, 1941

Carbide and Carbon submits definite production estimates.

July 31, 1941

Design work starts on 10,000-ton-a-year butadiene unit.

Aug. 22, 1941

Government authorizes construction.

Dec. 7, 1941

Pearl Harbor

Dec. 15, 1941

Design "frozen" for 20,000-ton-a-year alcohol-to-butadiene plant.

March, 1942

Japanese occupy Malay Peninsula and Dutch East Indies; cut off about 90 per cent of U.S. natural rubber supply.

April, 1942

Construction on the first of four 20,000-ton-a-year butadiene units starts at Institute, W. Va.

July, 1942

Construction of 25,000-ton-a-year styrene plant starts.

Sept. 10, 1942

Rubber Survey (Baruch) Committee report accepted.

Jan. 29, 1943

First large-scale, alcohol-to-butadiene unit goes into operation two months ahead of schedule.

April 7, 1943

First styrene unit begins operation.

May 25, 1943

Fourth 20,000-ton-a-year butadiene unit begins operation at Institute plant.

August, 1943

Four 20,000-ton-a-year butadiene units producing at rate of 120,000 tons a year—50% over rated capacity.

"I learned to solder in school — with KESTER!"

Photo Courtesy Douglas Aircraft Company

• By all means, technical courses offered young women this year should include soldering. It's a big new field for women, by-product of the crying need for manpower in war production—it offers immediate employment at good pay—it is work women like, at which they are especially apt.

• Teach them with Kester Flux-Filled Solder, the kind they'll use "on the job." They'll have less to unlearn, their production will more quickly be up to par, when they go to work in a war plant.

• Soldering is easier to teach with Kester, for the same reasons that Kester Flux-Filled Solders are Standard for Industry. Flux and alloy both are applied in one simple operation. No separate flux to make the work hit-and-miss, or to spatter the walls, floors and benches in your schoolroom.

• Students who learn soldering with Kester—who know what it's all about when they go out after jobs—reflect credit on their instructor!

☆ BUY WAR BONDS ☆

KESTER SOLDER COMPANY
4257 Wrightwood Avenue, Chicago 39, Illinois
Eastern Plant: Newark, N. J. Canadian Plant, Brantford, Ont.

KESTER
FLUX-FILLED SOLDER

The New K-O UNIVERSAL TOOL GRINDER

... now coming off the assembly line. Maintenance or production with speed, accuracy, and dependability at minimum capital outlay.

Write for Bulletin UTG-43-IA.

K. O. LEE COMPANY
ABERDEEN SOUTH DAKOTA

Every School Shop needs this versatile tool

LUFKIN COMBINATION SQUARE TOPS THE FIELD

This precision built tool, consisting of a tempered, machine-divided blade with square and center heads (cast or drop-forged) has so many varied uses as to be virtually indispensable to all mechanics working with metals.

Heads can be securely set quickly and accurately. Square heads have level glass and steel scriber. Graduated English or metric.

... Teach Good Workmanship With Good Tools ...

LUFKIN
SAGINAW, MICHIGAN . NEW YORK CITY
TAPES . RULES . PRECISION TOOLS

Four—with Fighting Files—Release the Fifth to Fight

DELTA FILES

DELTA

DELTA FILE WORKS, Inc.
Philadelphia 37, Pa.

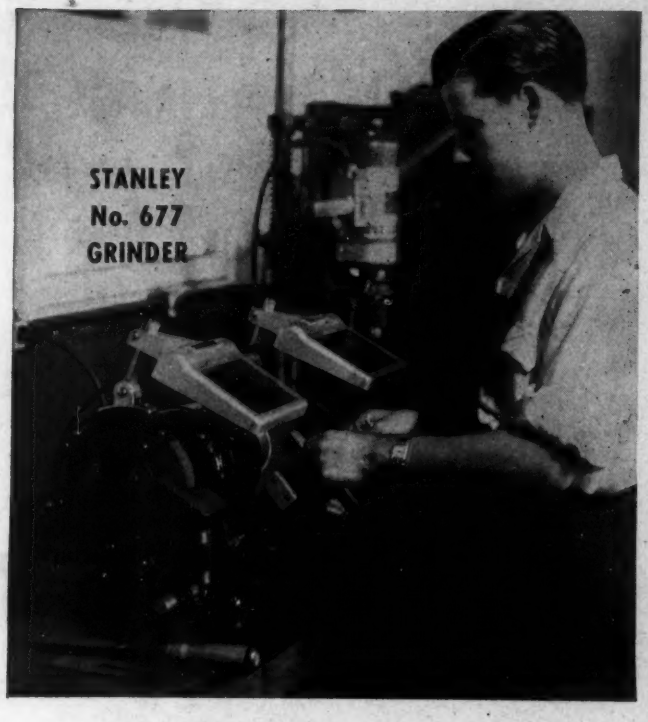
WITH Delta Files, four can do the work of five. Proof? Actual scientific tests have shown that *Delta Files will do on the average 25% more work in the same amount of time, with the same effort.*

The men you teach today are the skilled workers of tomorrow. Show them the value of saving time, of using tools that give full capacity.

Tell them about the Delta File—it's a glutton for hard metal. It chews away the rough spots. Bites deep. Each tiny steel tooth takes full measure—and 25% more.

MAKE THIS TEST

Clamp a bar (say 1 inch square), upright in a vise. Cut a hole in a sheet of paper to fit over the bar. Take 50 or 100 strokes with a Delta, each side, and collect the filings. Do the same with your present file. Now, weigh the filings. The difference is likely to surprise you.



One Good Tool Preserves Another

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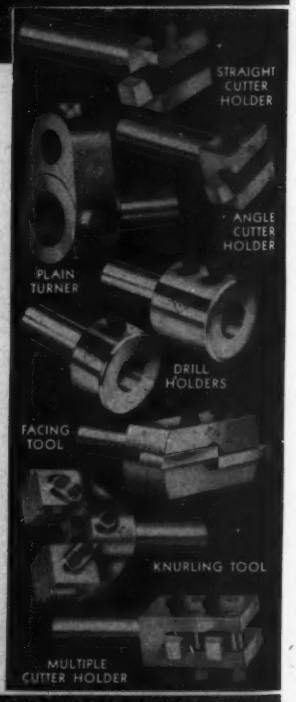

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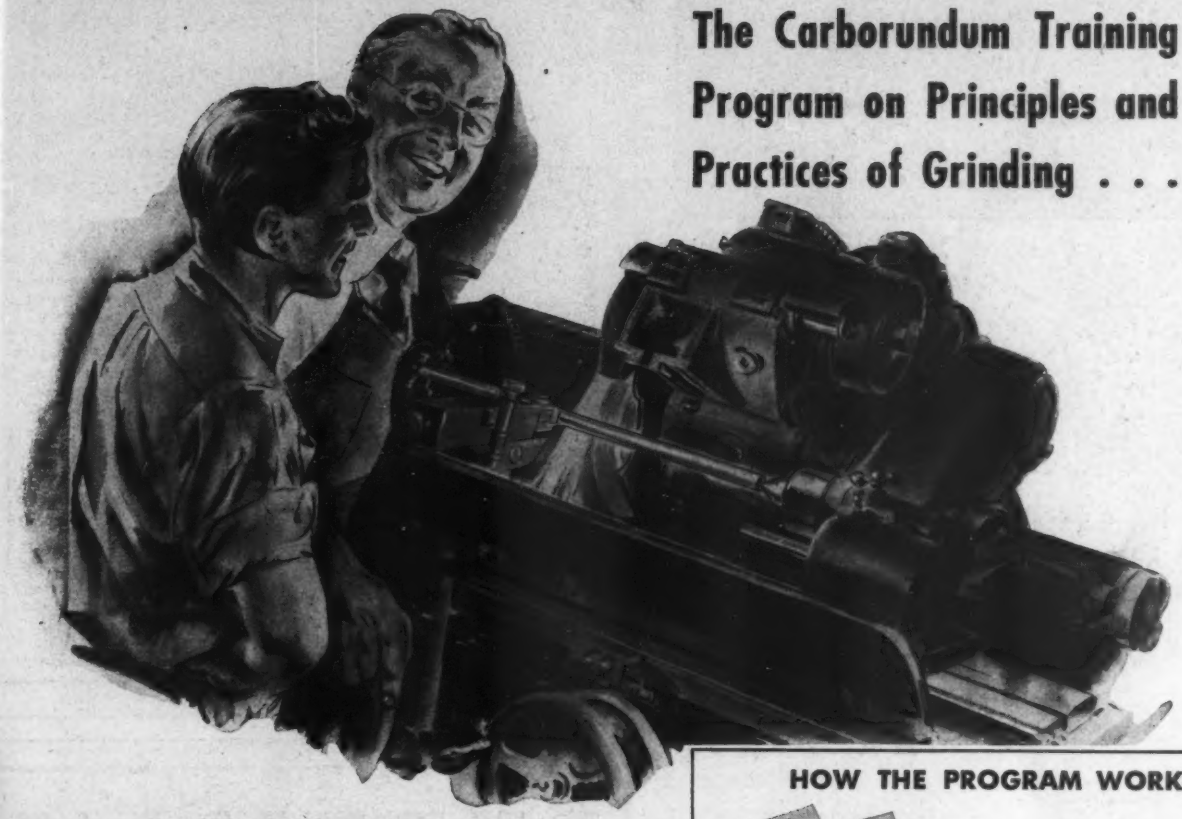

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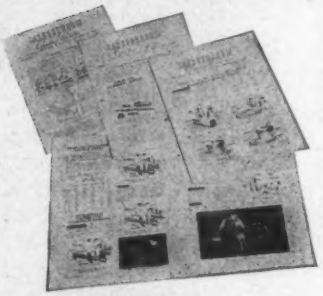

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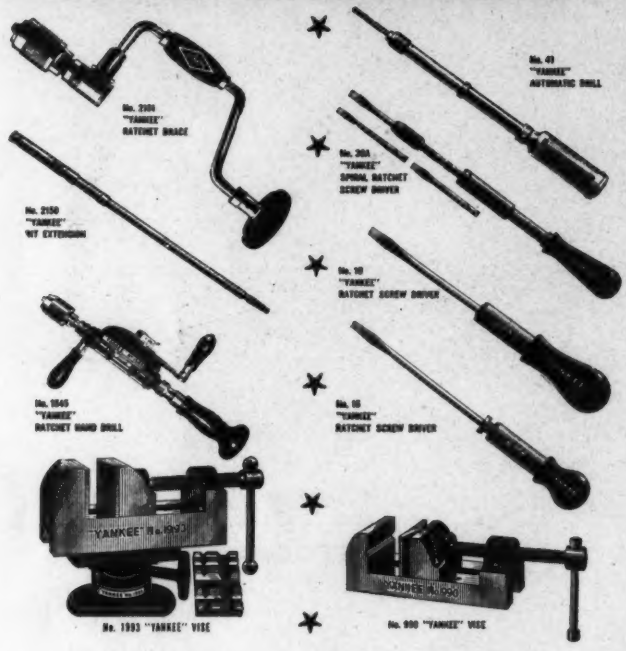

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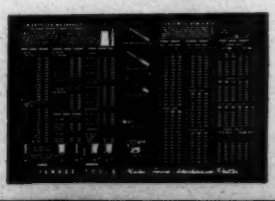

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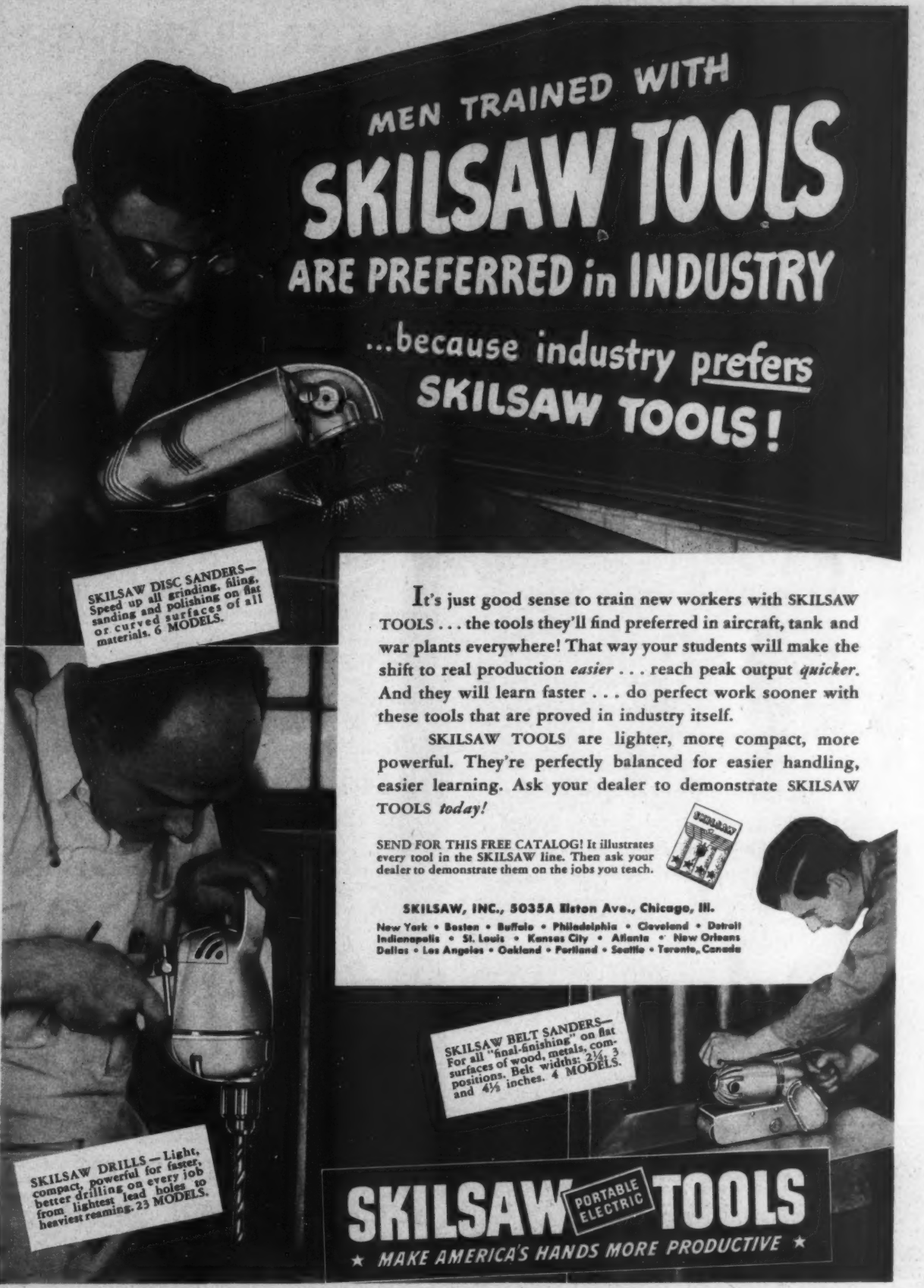
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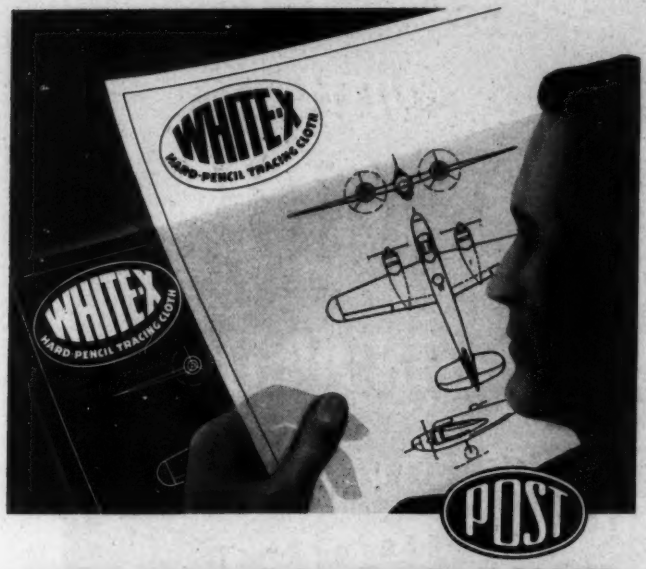

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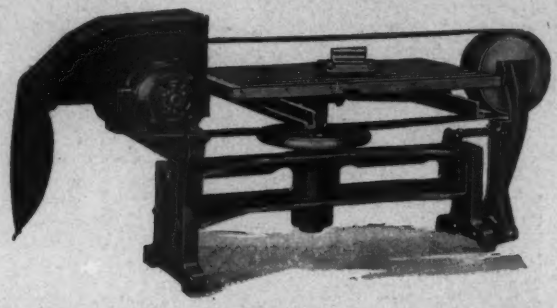

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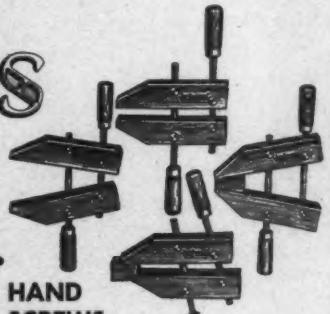

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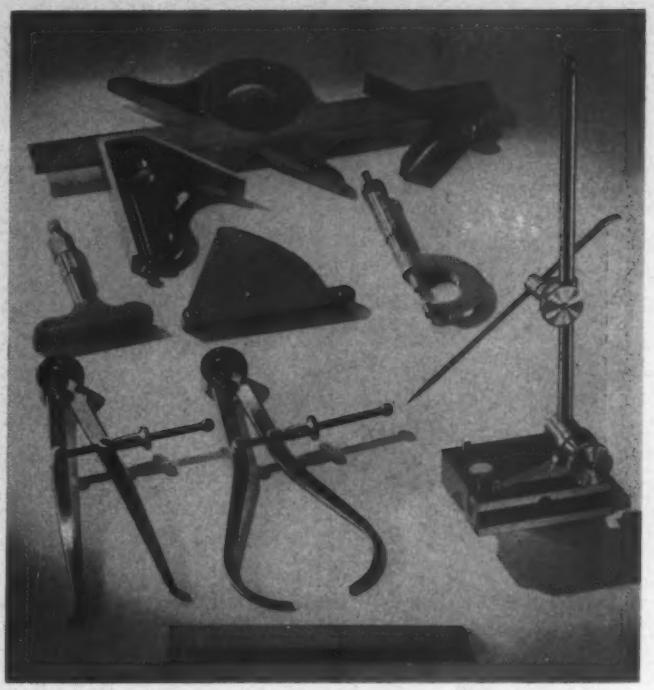

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Now going to work on precision jobs everywhere in American metalworking are fine new instruments bearing the Millers Falls name . . . and the old familiar Goodell-Pratt is no more. *But only the brand name is changed.* Actually, Millers Falls Company has been producing this equipment for some years. The difference now is two-fold: the famous Goodell-Pratt brand, retained on this line since the union of the companies, is yielding to the name of the present firm; and our production capacity has been materially enlarged.

As a result Millers Falls Precision Tools will be increasingly important to American metalworking. Built with Millers Falls traditional high regard for quality in design and production, they're unusually good values delivering long, dependably accurate service. Illustrated here are a few of the precision tools in Millers Falls' wartime line. Details on request.

Calipers and Dividers • Feeler Gauges • Surface Gauges • Micrometers
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LATHE FILING

LESSON No. 6 ON SPECIAL FILES FOR SPECIAL PURPOSES

Lathe filing embodies a distinctive filing technique no mechanical-training student can afford to overlook. In machine building especially, there are many occasions when it is necessary or desirable to file steel or other metals while the part is revolving in the lathe. In most cases, this is done to remove a small amount of material to true up the part, to make it fit properly, to remove tool marks — or, in general, to produce a better finish. Often, a lathe-turned part is purposely left a few thousandths of an inch "oversize" to permit a lathe-filing finish.

SUCH parts usually consist of shafts, spindles, dowel pins, gears, hubs, rolls—in fact, anything round that can be set up in a lathe in such a manner that a file may be applied to the surface while the part is revolving.

Lathe File vs. Mill File. In the past, a regular Mill Bastard File was frequently used for lathe filing. However, it has one serious disadvantage: the teeth have a tendency to fill up with chips, consequently causing a scratching of the surface of the part. In the specially designed Nicholson or Black Diamond Long Angle Lathe File, this difficulty is overcome.

Design and Construction. Through an increase of from 25° to 45° in the angle of the teeth of the Lathe File, the chips slide down the gullets and are forced out at the edges by the motion of the work against the file. This not only makes the file virtually self-clearing, but provides much cleaner shearing, eliminates drag or tear, prevents "chatter," and assures much faster cutting.

"Safe" (uncut) edges on this file protect any shoulders of the work which are not to be filed. They also protect the "dog" which enables the work to revolve against the file.

How to Use the Lathe File. In lathe filing, the work should always be revolved *toward* the operator, and the speed should be greater than that used for the tool-cutting operation. The operator should stand at right angles to his work; and he should be sure his hands and arms are not likely to come in contact with any moving part of the lathe or work.

In holding the file against the work revolving in the lathe, it should not be held rigid or stationary, but should be "stroked" lightly, the work revolving against the file automatically providing sufficient pressure, as a rule. A slight gliding or lateral motion assists the file in clearing itself of chips, and also avoids producing ridges or scores.

It is also important never to run the hand over work on a lathe, as the accumulated oil and moisture from the hand will so coat the surface of the work as to make it difficult for the file to take hold again.

A range of reasonable surface speeds for lathe filing various metals and alloys is as follows:

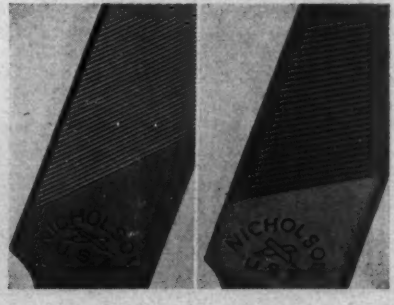
	Ft. per min.
High Carbon-High Chrome Steels	100 to 125
Stainless and Nichrome Steels	125 to 150
Annealed Tool Steel	150 to 175
Cast Iron	150 to 200
Machine Steel	350 to 400
Copper	400 to 450
Monel Metal and Bronze	450 to 500
Yellow Brass	500 to 550

On non-cylindrical (oval, elliptical or irregularly rounded) forms, the finer or lighter cutting Swiss Pattern Files will often be found more satisfactory than either the Long Angle Lathe or any standard Mill File. These files are made in a wide range of shapes, sizes and cuts.

Consult a mill-supply house on available Nicholson or Black Diamond Lathe and other special purpose files.

"FILE FILOSOPHY"—Need more copies of this famous Nicholson "textbook" for your school-shop instructors? Contains 48 authoritative pages on kinds, use and care of files; history, manufacture, terminology and other valuable information about files. FREE.

Long Angle Lathe File *Ordinary File*



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VOL. 32 NOVEMBER, 1943 Number 9

A Call for Your Help

Government orders require magazines to curtail their use of paper supplies drastically. The decision on "how" is up to the publisher.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has decided first of all to maintain the standard of its editorial service in both quality and quantity. It is our contention that now more than ever teachers, supervisors, and directors of industrial arts and vocational education are looking for and using the information and professional discussions in this, their professional magazine, to guide them in the efficient wartime operation of their school shops. Consequently, the publisher has met the situation by cutting the weight of paper and slightly limiting the number of available copies of each issue.

TO INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, for which nearly seven out of ten subscribers renew year after year, this presents a ticklish problem. Some readers have allowed interferences to prevent them from placing formal orders. Under present conditions we cannot send issues of the magazine beyond the subscription expiration date. This means that when your subscription is due for renewal we must have your order for continuation immediately.

Therefore, we ask your help. When you receive a renewal-reminder notice from our Circulation Department, please act at once. If you can send payment with order, fine. If remittance is to be made later, simply mark the memo statement "O.K. to Renew," sign, and return it. Bill will be sent later.

Reading your professional magazine is a valuable form of insurance, and it is patriotic, too. Acting promptly demonstrates that cooperative spirit that will help us all win through these times.

— The Publisher

This Month's Cover

The picture shows the nose section of a Lockheed P-38 pursuit ship before it has been mated to a center section.

Official O.W.I. photograph.

Question

Have you sent us your district zone number? A postal card will suffice.

CONTENTS

Industrial-Arts Offerings in the Small High School, *Roy R. Van Duzee* 357
Selection of Pupils in Vocational-Industrial Schools, *C. Kenneth Beach* 360
So You Want to Be a Printer, *Leonard E. Schmidt* 362
Kaiser's Localized Visual Education, *D. T. Hoxie* 363
An Armed Forces Induction Station as a Referral Point for Vocational Rehabilitation, *L. J. Lennon* 364
A War-Training Course for Teachers of Glider Construction, *Lynn A. Emerson* 365
Army Driver Training, *Harry H. Pence* 367
Industrial Arts for These Times, *J. I. Sowers* 367
Industrial-Education Needs as Seen by Industry, *Vernon Olson* 368
Editorials 369
Establishing Store Relationships for a Cooperative Program of Distributive Education, *Murray Banks* 370
Wartime Woodworking Industry and Vocational Training, *Isadore M. Fenn* 373
Skin Troubles of Machinists and Machine Tool Operators, *Dr. Waldemar Schweisheimer* 374
Contribution of Industrial Arts to General Education, *James E. Hopkins* 375

Problems and Projects

Simplified Tube Tester, *James W. Hoskins* 376
Cleaning the Circular Saw Helps to Keep it Sharp, *Donald Maley* 377
Good Mortise-and-Tenon Joints, *Donald Maley* 377
Color in the Finishing Room, *Dean F. Smith* 378
Equipping Power Machines With Motor Drives, *Clifford Evans* 379
Progress Chart, *Donald Maley* 380
Creative Design, *Richard E. Bailey* 381
Camouflage Course, *Richard E. Bailey* 382
Design for the Teacher of Industrial Arts, *Burl N. Osburn* 383
Bracelet Designs, *Cecil Ford* 385
Techniques in Using a Jointer, *John McInnes* 385
Whittling-Jackknife Technique, *W. Ben. Hunt* 385
Drawing for Fun and Profit, *A. G. Pelikan* 387
Airplane Sheet-Metal Shop Practice, *M. D. Caffin* 388
Modern Typography, *John L. Deal* 389
A Welded Metal Toolbox, *W. W. Scott* 390
Forged Fireplace Tools With Staghorn Handles, *Augustine J. Brezina* 391
A Low-Cost Pocket Multirange Voltmeter, *Paul Payne* 392
Dummy — New Type Explosive Incendiary Bomb, *Isadore M. Fenn* 393
Maple Night Table, *Neil Flanagan* 394
Representative Arrangements for Teaching Electricity in Vocational Schools, *F. Theodore Struck* 396
An Improved Jointer Stick, *V. E. Broadbent* 397
Preflight Aviation Entrance Examination, *Sidney S. Hay* 398

Questions and Answers 22A
Personal News 24A
Association News 29A
News Notes 30A
New Publications 34A
Shop Equipment News 36A

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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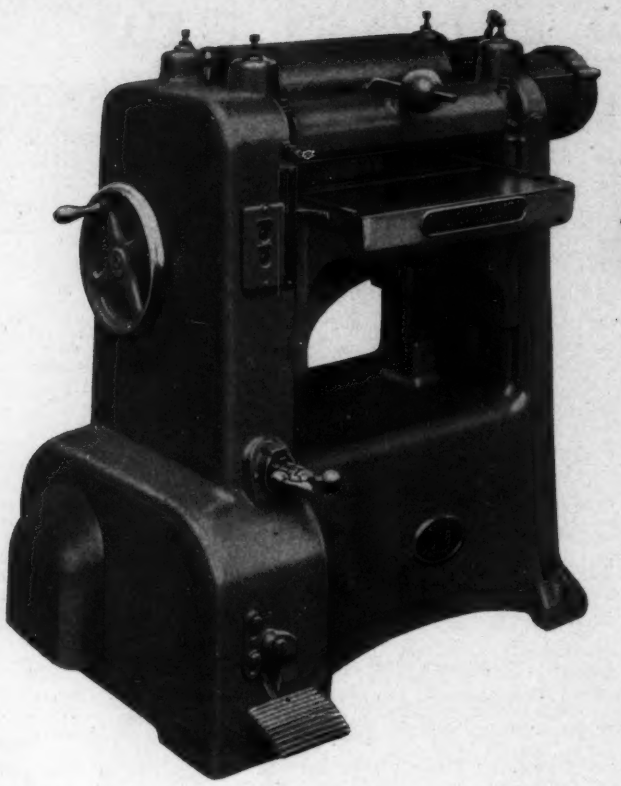

J-18 SURFACER

No. 48 of a Series

SHORT TALKS ON WOOD

HOP HORNBEAM (*Ostrya virginiana*)

This is the tree which produces the commercial wood known commonly as Ironwood. Derives its name from the hop-like fruit which it bears. The wood is very strong, hard, tough and durable. Close grained. Difficult to work. Takes a high polish.

Its use is somewhat restricted due to the limited supply, but it is used principally for specialities such as tool handles, levers, wedges, mallets and ladder rungs.

Is widely distributed over eastern United States from the Dakotas, Kansas and Texas to the Atlantic seaboard. A common tree but not abundant. Prefers a moderate amount of shade, and moist locations near streams and lakes. Rather slow growing.

A small, slender, round-topped tree usually not more than 20 to 30 feet tall and 8 to 12 inches in diameter. Very graceful in appearance yet it is not fully appreciated as an ornamental. Its small size makes it well suited to yard planting. Because of its toughness is not easily damaged by storm or wind. Sometimes mistaken for elm but can be readily distinguished by the fruit.

The bark is grayish-brown and finely ridged. The leaves are simple, alternate, nearly oblong, pointed, sharply toothed and are from 3 to 5 inches long. Bears a very distinctive fruit which consists of a cluster of loose papery bags each containing a small brown nutlet. Closely resembles the fruit of the hop vine.

The life expectancy of Yates-American machines is unusually high. Given reasonable care you can depend on them for many years of dependable service. Here are a few operating suggestions which will help prolong the life of the J-18 Surfacer.

Avoid taking too deep a cut especially when working hard wood or wide stock. It is better to take several light cuts than one heavy one. The sound of the machine during the cutting operation is a good guide as to the correct amount of cut to be taken.

Long boards or planks should be supported at the outfeed end of the machine, otherwise a severe strain is imposed on the feed mechanism.

When surfacing short stock, the pieces should be butted, that is, sent through end to end. If surfaced singly they must be at least 9 inches in length — longer than the distance between the pressure bars — otherwise dangerous kick-backs are liable to occur. It is well to use a pusher stick when in doubt.

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Industrial-Arts Offerings in the Small High School

ROY R. VAN DUZEE*

For some time prior to the war, there was a grave doubt in the minds of many educators as to the functional value of much of the high school curriculums in the lives of the young folks in attendance. There is no doubt but that the pattern of the curriculum has been too greatly dominated by tradition and the idea of pointing graduates for entrance into college. Generally speaking, the small high schools have not departed from the traditional pattern of school offerings as much as have the larger high schools. A study of the industrial-arts offerings in Wisconsin high schools shows this to be true in that state. The author's experience in industrial-arts education, extending back to a period prior to World War I and a consideration of the place industrial arts has in the lives of young people in peace and wartimes, leads him to draw attention to the specific ways in which industrial arts meets the present and future needs of high school students and to suggest courses of study for an industrial-arts curriculum in the small high school. In order to present viewpoints of more than current necessity and to show the real need of industrial-arts education in long-range planning, it seems appropriate to present information from educational history; personal experience in the practical-arts field; the results of studies in the small high school of Wisconsin; and the recommendations of the U. S. Office of Education relative to industrial arts in the interests of the war effort.

Let us consider for a few moments what have been the aims and offerings of shopwork in the past, and then give some thought to the industrial-arts offerings in the small high school at the present time.

What is taught in the school and where the emphasis is placed is dependent a great deal on the apparent national needs at the time. The Russian system of teaching the mechanic arts was instituted in 1868 in the City of Moscow School of Trades to teach the fundamentals of joinery, wood turning, blacksmithing, locksmithing, and the like. The students, who were being trained in civil engineering, mechanical engineering, drafting, foremanship, and chemistry, were taught to make a series of models involving carefully graded exercises of increasing difficulty. This work was strictly vocational. Educational Sloyd, on the other hand, was introduced in Sweden as a general education subject. In woodwork it attempted, through a series of *useful* models into which were incorporated some sixty operations, to (1) install a taste for, and a love of, labor in general, (2) to instill respect for rough, honest, bodily labor, (3) to develop independence and self-reliance, (4) to train in habits of order, exactness, cleanliness, and neatness, (5) to train the eye and sense of form to cultivate dexterity of hand and develop touch, (6) to cultivate habits of attention, industry, perseverence, and patience, and (7) to promote the development of physical powers.

The Russian Exercise system was the basis of manual training in the secondary schools of the United States from 1890 on for many years. Swedish Sloyd was the foundation for the elementary school manual-training work. In answer to the criticism that manual training did not correlate with art instruction and that no attempt was made to teach design, there was introduced the idea of emphasizing the art side of manual training. This led to the use of the term *manual arts* after 1893. The arts and crafts movement after 1897 stimulated the manual-arts concept of shopwork in the schools and more emphasis was given to design in connection with manual work. A statement from *Handicraft* issued in 1902 by the Arts & Crafts Society of Boston: "The conditions of line handicraft are natural aptitude, thorough technical training, and a just appreciation of standards. The unit of labor should be an intelligent man, whose ability is used as a whole and not subdivided for commercial purposes. He should exercise the faculty of design in with manual work, and manual work should be part of his training in design."

At the turn of the century the influence of John Dewey vitally affected shopwork. The formalism of set models in elementary schools gave way to the use of handwork as method of teaching, and in 1913 Frederick Bonser developed the idea that industrial arts was both a subject and a method. Bonser advanced the idea that industrial arts was concerned with the changes that take place in materials to make them into finished products and in the social and economic problems in connection with making, selecting, and using the products. It will be noted that Bonser was concerned with the consumer aspect of industrial arts as well as the producer aspects.

It is often said that teachers teach what they were taught and in the way that they were taught. The result is that most courses lag considerably behind what should be taught if the course offerings were tuned to national, regional, and local needs. This also shows how fallacious is the argument that students should be educated only for purely local present needs.

The author's elementary shopwork consisted of courses in Sloyd work and his secondary shopwork had to do with manual training based on a combination of the Russian exercise and the manual-arts idea. The media used were principally wood, and then, of course, the mechanical-drawing supplies. His normal schoolwork was along the lines of the high school work with machine work added to the hand woodwork, to which were added further courses in machine-shop work, forging, bricklaying, and freehand drawing. Practical work was in the fields of carpentry and millwork.

His first year of teaching was done in 1914 in a town of 5000 people in an agricultural state. The courses taught were chip carving in the sixth grade, mechanical drawing and woodwork in the seventh, eighth, ninth, and tenth grades. Due to the fact that the basketball team he coached won a few games, the author got a promotion as department head in a larger city in the same state. His assignment in the second position included basketball coaching. The courses offered in the second school, for the first two years, were identical with those in the first town.

In the summer of 1916 he and his superintendent took work in Columbia University under Dr. Bonser, thus getting a thorough inoculation with the industrial-arts idea. In our classwork and demonstration courses, we worked up the plan

*Director, West Allis School of Vocational and Adult Education, West Allis, Wis.

for offering woodwork, mechanical drawing, electrical work, printing, and sheet-metal work in the junior high school; and woodwork, drawing, concrete work, auto mechanics, printing, carpentry, and electrical work in the senior high school. On their return, the superintendent and he presented the plan of expanding the industrial-arts offerings to the board of education. There was considerable opposition to the idea because it was said, "This is a ranch and farming country; boys don't need all that work." However, the plans were put into effect. Years later the writer was able to show one of the board of education members that the idea of educating children for a certain area was wrong. Five out of the six children in this man's family lived outside of the state in which they were raised, and only one was a farmer. Their occupations were: two housewives, one store owner, one farmer, one radio singer, and one general manager of a wholesale grocery house. This illustration is not an isolated case, but seems to be the pattern followed by a large per cent of those who live in agricultural areas.

What is the situation today? It seems that we are in about the same fix as we were during World War I. The Smith-Hughes Act was enacted to take up the deficiency in skills found lacking at the time. We have been concerned with offering for the past several years a type of education, particularly in the small high schools, which was not functional. Really, the curriculum of the small high school was no more suitable to peacetime than it has proved to be for wartime.

Let us examine the aims, curriculum, and course offerings which would be suitable for the small high school in peacetimes. Before doing this, however, it might be well to define what is meant by *a small high school* and to list some of its characteristics. The points listed come from data on small high schools in Wisconsin gleaned from a study made by the State Department of Public Instruction, Madison, Wis., 1936.

Facts on small high schools in Wisconsin:

1. Schools studied were those which have ten teachers or less.
2. There are 200 such in Wisconsin.
3. School attendance is low — increases in enrollment can be expected (in normal times).
4. Four out of five of these schools are located in distinctly rural areas and over one half of the pupils live on farms while attending high schools.
5. The teachers are young, inexperienced, teach many subjects, and some are ill-prepared to teach. Their yearly salary is low.
6. *The curricular pattern is limited generally to college preparatory courses. Seventy of the small schools offer nothing outside of academic work.*
7. Library facilities and visual aids are generally inadequate.
8. Of employed boy graduates, one fourth are on farms, one third are in commercial and industrial occupations, and one twelfth are teachers.
9. Less than 10 per cent of the graduates of the small high schools complete a four-year college course.

From the foregoing, it seems that the curriculum for schools of this kind should be one that would satisfy the needs of the individual, no matter where he might live in the United States, since people are very mobile. It should take into account national, regional, and local needs. The curriculum should appeal to the interests and abilities of all of the student body, not merely the 10 to 20 per cent who intend to go to college. It should be concerned with agriculture, industry, commerce, homemaking, as well as the professions. The curriculum should develop the ability to plan and to carry out the plan; it should develop resourcefulness and character. It should develop fine attitudes, patriotism, and strong, healthy physiques. This curriculum should provide a functional education that will develop the necessary technical skills required in a modern civilization, understandings and attitudes for effective participation in a democracy, and a healthy citizenry. It is difficult to see how the narrow curricular offerings of most of the small high schools can do this.

It may be readily seen that if the small high school is to meet the needs of the youth of today, the schools must add industrial arts to the curriculum and this course should cover a wide range of activities. The curricular recommendations of the pamphlet referred to contains the following:

"4. Every small high school should offer training in industrial arts with special relation to the farm, the work about the home, and the small repair shop or industry. The relevant facts are (1) that many graduates living on farms and in small communities will often have need for manual skills, and (2) that a number of them will work in garages, local repair shops, skilled and semiskilled trades. The principles of immediate interest, relevant to out-of-school environment, and contribution to the community are applicable."

To cover the needs of the student in the small high school the offerings should cover the basic construction activities in agriculture and industry, and include the basic materials, products, and mechanisms of the farm, the home, and industry. Not less than two years of industrial arts should be offered, with two years' work offered as elective work.

Suggested Courses

It is believed that the courses outlined herewith might well be included in the small high school industrial-arts course. They should cover the planning; related mathematics and science; characteristics, application, and costs of materials; safety instruction; and other information concerning the activity as a trade or industry. The activity should be given consideration in the guidance plan in the school. Opposite the course listing is shown the "use source," which indicates the jobs done on farms. This listing shows a functional relationship between suggested course offerings and activities performed on farm homes, where one half of the small school population in Wisconsin resides.

The inclusion of such a course as shown in this outline would prepare the student to take his place on the farm with the basic skills necessary to do the construction, operation, and maintenance of the equipment and buildings on the property. If the boy moves to a city, he would have the basic skills necessary for success in many industrial pursuits. The skills and information would be, also, basic background for the understanding of and living in our mechanized society, and would be available for physical and mental outlets in the hobby activities.

We have heard a great deal about the training programs of Germany and of the large number of vocational schools and teachers in that country. We have been told of the special skills trained into a large proportion of its male population. It is common knowledge that there is a shortage of trained men in for the technical services of our fighting forces. The induction of the 18-year-olds means that the skills required of our fighting men should have a good foundation from their high school education. U. S. Commissioner of Education John W. Studebaker said in a radio broadcast September 25, 1942, when the U. S. Victory Corps program was announced, "I also must know that in this total war the federal government must count on youth to be well prepared the day they leave school to take their places in war work, in industry, in agriculture, in the armed forces, and in other vital services." Preinduction pupil programs have been recommended to school administrators as being urgently needed to prepare youth for the war emergency.

The preinduction courses already developed show a striking similarity between the courses suggested as being essential to the curriculum of the small high school. Apparently, those courses needed as basic training for mechanized warfare are about the same as are those needed for the operation of a modern farm as basic training for industrial work and as necessary to living in any modern society.

What is the relationship between the percentages of people in the various occupational classifications in the United States and the industrial-arts course offerings? For illustrative purposes, two tables from the Department of Commerce, Bureau of Census, Sixteenth Census Reports, Population, Second Series, Table 19, for certain states listed, are shown. Table I is a percentage distribution of employed workers 14 years old and over by occupations, 1940; Table II gives a per-

SUGGESTED COURSE OUTLINE

Course	*Use Source*
I. Woodwork (carpentry)	Construct small buildings, gates, doors, boxes, troughs, concrete forms, repair buildings.
II. Shop sketching, blueprint reading	Interpret plans, follow directions for assembling devices, operations, diagrams, make field plots, floor plans, figure stock bills.
III. Electricity	Use of d.c. electricity, batteries, generators, motors, light plants, wind chargers.
	Use of a.c. electricity, wiring codes, wiring, operation, adjustment, repair and maintenance of motors.
IV. Gas engines and auto repair	Operation, adjustment, maintenance repair of gas engines, tractors, trucks, and automobiles.
V. Machinery assembly and repair	Assembly, operation, adjustment, maintenance, and repair of machinery.
VI. General metalwork — cold and hot, forging and acetylene welding	Construction, repair of devices made of metal — basic hand and machine operations included in III, IV, and V.
VII. Concrete construction	Construction of troughs, floors, tanks, posts, foundations, chimneys, walls, etc. Repair of same.
VIII. Miscellaneous unit — harness repair, plastics, special interests	Select, adjust, and maintain harness.

centage distribution of employed workers 14 years old and over by industry groups, 1940.

It will be noted that for the states of Iowa, Michigan, Wisconsin, Illinois, California, and New York that percentages in the various occupations run within a fairly close range, except that the number of clerical workers; craftsmen, foremen, and kindred workers; and operatives and kindred workers is low, and the number is relatively small in Iowa and Wisconsin. Also, it will be noted that farm laborers are more numerous in Iowa and Wisconsin.

With respect to the percentage distribution by industry groups, it will be noted that all divisions run within a narrow range, except that for Iowa and Wisconsin the agriculture percentage is high and that for manufacturing Iowa runs much lower than the average, and that California is slightly lower than the average.

These figures seem to point to the idea that students taking an industrial-arts course in a small high school would be well prepared to take their place in whatever part of the country they should choose to reside. They would be prepared to live on a farm after finishing high school, and also they would be educated so as to adjust themselves to the economic and social situation in whatever part of the country they may eventually settle.

Conclusion. A consideration of the facts herewith presented seem to justify the inclusion of a diversified industrial-arts program in the small high school and that opportunities to pursue special activities on a vocational basis should be open to certain students who show special interests and aptitudes for the following reasons:

1. Industrial-arts courses develop technical skills, information and attitudes necessary to the individual, no matter where he chooses to live, be it on the farm, in the city, in the East, West, North, or South.
2. Such courses do not preclude college preparatory objectives, a fine health program, the development of proper attitudes and viewpoints, but are an integral part of an educational program that would include all of these factors.
3. The industrial-arts work is not something that has temporary usefulness — it is good in times of peace and in times of war.
4. Industrial-arts courses properly taught develop the ability to appraise a problem, make a plan with which to solve it, follow a plan through to a solution, thus developing initiative, resourcefulness, and dependability — characteristics vitally necessary to the democratic way of life.

It is the firm belief of the writer that a diversified industrial-arts course must be placed in the curriculum of all small high schools. Recent programs of governmental agencies have demonstrated that if the public schools do not offer functional educational programs that some other agency will do it.

How the presentation of these offerings is to be accomplished might well be the subject of an extended study. The difficult problem of school administration, preparation of course content, methods of teaching, physical setup, and the preparation of the teacher to carry on the program in the small school are problems requiring special study and specially trained teachers.

Table 1. Per cent distribution of employed workers 14 years old and over, By Major Occupation Group: 1940

State	Professional Workers	Semi-Prof. Workers	Farmers and Farm Managers	Proprietors, Managers, and Officials (Except Farm)	Clerical, Sales, and Kindred Workers	Craftsmen, Foremen, and Kindred Work	Operatives and Kindred Workers	Domestic Service	Service Workers, Except Domestic	Farm Laborers, (Wage Earners) and Farm Foremen	Farm Laborers, (Unpaid Family Workers)	Laborers, Except Farm	Occupation not Reported
Iowa	6.6	0.7	24.0	8.7	13.9	8.8	10.7	3.5	5.7	7.4	4.0	5.0	1.0
Michigan	6.1	1.2	7.9	7.6	16.9	15.2	23.2	3.3	7.3	2.2	1.4	6.8	0.9
Wisconsin	6.3	1.0	16.1	8.2	14.8	11.5	16.2	3.4	6.2	3.1	4.4	6.0	0.8
Illinois	6.6	1.2	6.5	8.6	21.6	13.0	19.9	3.3	8.9	2.2	1.0	6.5	0.8
Ohio	6.5	1.1	7.5	8.6	18.2	14.5	21.3	3.8	7.3	2.9	0.9	7.2	0.9
California	7.9	1.7	4.0	11.2	20.8	12.8	15.2	3.5	10.6	5.2	0.5	6.0	0.7
New York	7.8	1.5	2.4	9.8	23.2	12.2	20.1	4.6	10.5	1.4	0.3	5.2	1.0

Table 2. Per cent distribution of employed workers 14 years old and over, By Industry Groups: 1940

State	Agriculture	Forestry and Fishing	Mining	Construction	Manufacturing	Transportation, Communication, and other Public Utilities	Business and Repair Service	Wholesale and Retail Trade	Finance, Insurance, and Real Estate	Personal Services	Amusement, Recreation and Related Services	Professional and Related Services	Government	Industry not Reported
Iowa	35.8		0.7	4.2	11.4	6.6	2.1	16.8	2.5	6.7	0.7	7.9	2.7	1.9
Michigan	11.7	0.1	0.9	4.0	38.4	5.5	1.8	16.2	2.6	6.9	0.8	6.7	3.0	1.3
Wisconsin	25.8	0.2	0.2	3.7	25.5	5.7	1.8	15.8	2.3	6.6	0.6	7.5	2.9	1.4
Illinois	9.9		1.7	4.1	28.6	9.0	2.3	19.5	4.1	7.8	0.9	7.3	3.5	1.3
Ohio	11.0		1.4	4.3	33.4	7.4	2.0	17.4	2.9	7.5	0.8	7.4	3.1	1.4
California	10.5	0.3	1.3	6.0	16.5	7.9	2.7	21.8	4.7	9.5	2.4	8.6	5.9	1.3
New York	4.2	0.1	0.2	4.9	27.3	8.3	2.4	19.8	6.0	9.9	1.2	9.1	4.4	2.3

Note: Clerical workers are included in the industry groups

"At its best, industrial arts may be depended upon to aid in the normal life and growth of a youngster, to stimulate his imagination, to afford the daily joy that is his right, to make him conscious of manhood and of the part he will play in that near day as workman, and father and citizen." — *Homer J. Smith.*

Selection of Pupils in Vocational-Industrial Schools

C. KENNETH BEACH*

The selection of pupils for vocational-industrial schools is becoming an increasingly important problem. The problem is definitely critical at present because of the growing demand for trained personnel by war industries and the increased enrollment in these schools. It appears, however, that this problem will continue to remain significant even after the present war, since vocational-industrial education has been, and presumably will continue to be, in increasing demand.

There is, of course, a wide difference of opinion as to what procedures and practices are best in the selection of pupils. This article has been prepared to summarize some of the practices of pupil selection in vocational-industrial schools so that points of agreement may be established for future policies and procedures in schools where trade training is offered.

As a background to "A Study of Certain Factors Which Have Bearing Upon the Prediction of Success in Shop Courses in a Technical and Industrial School,"[1] a questionnaire survey covering 73 vocational-industrial schools in the United States, located in thirty states, was made. For the most part, the schools included in this survey were the largest in each state. The median enrollment of the schools was seven hundred. The schools offered a wide range of subjects with a total of forty-seven courses in which a pupil might major. The average was 12. The most common major courses, listed in the order of their frequency, were: (1) auto mechanics, (2) machine-shop practice, (3) mechanical drafting, (4) electricity, (5) welding, (6) printing, (7) carpentry, (8) cabinetmaking, (9) sheet metal, and (10) architectural drafting.

Selection of Trainees

General Policies of Selection. Who selects trainees? The results are shown in Table I.

Person Who Selects Trainee	*No. of Schools*
Principal or director	42
Assistant principal or assistant director	16
Counselor or guidance director	17
Instructor	19
Special committee	16

Table I. Selection of trainees

In several instances the selection was done by two or more of the personnel of the different groups listed above. The special committee generally included instructors, principals, vocational counselors, and assistant principals. In two instances, the special committee included employer representatives; in two other instances, the special committee included representatives of organized labor.

The foregoing facts indicate that the selection of trainees may be made by unqualified persons. Far too often when individuals who are not properly trained are assigned to trainee selection in vocational-industrial schools, personal whims and opinions have a dominating influence. The machine-shop instructor who also conducts the school band will often be inclined to admit the boy who plays a band instrument well even though the boy may not have the necessary interest aptitudes or abilities for the machine shop.

Minimum Age. Twenty-six schools insisted upon a minimum entrance age of 14; 4, an age of 15; 25, an age of 16; 3, an age of 17; 1, an age of 18. Thirteen schools had no minimum age requirements. In an unpublished study by Dr. Anthony J. Mitrano, formerly with the Rochester, N. Y., public schools, it was found that the older pupils applying for admission into a technical-industrial high school obtained the lower scores on group tests of intelligence and mechanical ability. The tests used included a revision of the Army Alpha by Wells, the MacQuarrie Mechanical Ability, and the Minnesota Paper Formboard. All pupils were making application for entrance to the ninth grade. The 17-year-old pupils obtained lower scores than the 16-year-old pupils; the 16-year-old pupils obtained lower scores than the 15-year-old pupils; and the 15-year-old pupils obtained lower scores than the 14-year-old pupils. In the light of Mitrano's study and similar findings in other schools, industrial educators might well ask themselves why they set a minimum age for admission provided a student will have reached the age when he may enter employment upon completion of training.

Number of Pupils Admitted. In September, 1940, 61,857 pupils made application for admission to 60 of the schools surveyed. *Only 35,506 were admitted! Only 11 of these 60 schools admitted all pupils who applied.* One school accepted only 290 of the 1500 who applied. Forty-seven schools stated that the number of applicants refused admission had increased within the past five years; while only six schools indicated no increase. The above figures clearly indicate a trend toward maximum enrollment with the problem of selection becoming a major factor. Forty-three of the 73 schools surveyed stated that they had a waiting list for admission.

Educational Requirements. Of the 65 schools giving the educational requirements for admission, 25 required an eighth-grade education, and 21 completion of ninth grade. Nineteen schools indicated no specific educational requirements. Only 11 schools required specific courses for admission, of which mathematics, industrial arts, science, and mechanical drawing were the most common courses required.

The data obtained on previous school marks showed that only 15 schools required that a minimum average be met for admission. These requirements ranged from a mark of 80, or *C* average, in elementary school, to a 90, or *B* average, in high school.

From the above data, it appears that many vocational-industrial schools do not set up specific entrance requirements relative to previous education either in grades completed or school marks.

Health. Twenty schools required a physical examination before admission. Fifty schools stated that physical requirements compelled pupil rejection in specific courses with the rejection being largely in the hands of the individual instructors.

Intelligence Tests. While psychologists in general make little distinction between intelligence tests and aptitude tests, for the purpose of gathering more specific information a distinction was made in this study. Twenty-five schools required all applicants to take a general intelligence test prior to admittance; 43 schools had no such requirement. Five schools stated that intelligence tests were given only to applicants who had not been tested previously. In other words, 41 per cent of the schools obtained an intelligence test score on all applicants. Nineteen other schools stated that wherever possible the scores made on intelligence tests in schools previously attended were used. Very few schools required a critical score on an intelligence test as an admission criterion.

It is of interest, also, that most schools reported that general intelligence tests were of the group variety only. The Otis Self-Administering Test of Mental Ability was by far the most common, being used by 38 schools. Ten schools stated that the Binet Scale was used; two reported the use of the Herman-Nelson Test of Mental Ability; and one, the Army Alpha.

Fifty-nine of the schools participating in the survey responded to the request: "Briefly give your opinion of the value of intelligence tests in selecting trainees." For purposes of convenience, the answers have been grouped in the classification following:

*State Education Department, Albany, N. Y.

[1] C. Kenneth Beach, *A Study of Certain Factors Which Have Bearing Upon the Prediction of Success in Shop Courses in a Technical and Industrial School*, A Doctor's Dissertation, Cornell University, Ithaca, N. Y., 1941.

Opinion	*No. of Schools*
Of no value in trainee selection....	4
Of little value in trainee selection..	15
Of some value in trainee selection..	28
Of considerable value in trainee selection	12

Table II. Opinion of the value of intelligence tests in selecting trainees

Opinions varied. but the majority believed that the tests were, at least, of some value in trainee selection. Many of those answering the questions stressed the necessity of using the results of intelligence tests only along with other results. This has been the contention of clinical psychologists for years. It is of interest to note also that in some instances schools indicated little or no interest in the scores made by prospective pupils on intelligence tests of all kinds.

Aptitude Tests. Aptitude tests, apart from general intelligence tests, were used to some degree by 36 of the 73 schools. Seventeen schools gave aptitude tests to all applicants before admission; 14 when there was some doubt as to the applicant's ability; and 5 stated that the tests were given in the school previously attended. There was no consistency in the kind of tests used.

Only 14 schools established a minimum score on aptitude tests for admission. On the whole, aptitude tests have been used for a shorter period of time than tests of general intelligence. In regard to the value of aptitude tests in selecting trainees, the reactions were about the same as for the general intelligence tests. The majority of schools considered them to be of more than a little value. Stress was again placed on the need of using the results of the intelligence tests *only along with other results.*

Interest Inventories. Interest inventories were found to be used by only 14 of the 73 schools. The fact that the interests of many youth are more or less in a state of flux would tend to substantiate the general policy that interest inventories should be used with caution. To illustrate this point, a teacher of occupations in a junior high school had called in various persons representing numerous occupations to speak to his pupils. At the end of the course, each pupil was required to prepare a term paper on the particular occupation which he, or she, thought he would like to follow. As the result of a visit by a local Army officer who appeared before the pupils in his uniform and gave an interesting talk on Army life, over 80 per cent of the boys prepared papers on the United States Army as an occupation.

The Interview. The interview was found to be the most popular technique used in the selection of trainees. Forty-nine schools interviewed all applicants where doubt existed as to the applicant's qualifications. Six schools stated that while they did not interview the applicant, he was interviewed in the school previously attended. Only one school answered that interviews were not granted at all.

Length of Interview	*Number of Schools*	*Per Cent*
Less than 15 minutes.....	21	33
Between 15 and 30 minutes	37	59
Over 30 minutes.....	5	8

Table III. The length of the interview

It would appear from the foregoing information that in many schools the interviews are not of sufficient length to obtain adequate information upon which to determine the qualifications of a pupil.

Fifty-four answered the question on the length of time elapsing between the interview and the selection. The following is a summary of the answers:

Length of Time	*No. of Schools*
When application is made.....	3
Within one week.....	20
Within one month.....	8
Over one month.....	23

Table IV. Length of time elapsing between the interview and the selection

In some cases, the interviews were conducted by practically the entire personnel of the school, including office secretaries. However, in many of the schools, the principal, or director, did the major share of the interviewing.

In 50 schools the interviewer has information on the applicant prior to the interview, while 15 schools said that they did not, and 8 schools failed to answer the question. *Only 16 schools used a fixed set of questions for the interview.*

While the interview is by far the most used technique in the selection of pupils, it is apparent that many of the procedures followed are not in accord with good interview practices. The holding of an interview of less than 15 minutes, not having information on the applicant prior to the interviews on the part of the entire school staff are questionable practices.

Evaluation of the Interview. It was felt desirable in considering the interview as a technique in trainee selection practices to find also what items characteristic of the interview were considered and the relative importance placed on each. A check list involving evaluations of eight items that might be considered in an interview and which could not be ascertained as well in other selection techniques was included in the questionnaire.

The eight items, selected on the basis of a review of the literature dealing with the interview, were set up so that they were answered on a scale of: (1) of greatest importance, (2) important, and (3) of little importance. Rank orders were obtained by finding the total number of judgments given for each scale point, multiplying the number by the value 3, 2, and 1 respectively, and dividing the totals by the number of jurors rating each item.

The general interest of the applicant in the interview was considered of greatest importance. By interest such items as keenness, ambition, and attitude were considered. The temperament, grooming and general physique of the applicant were considered as being important, while diction, ability to hold a conversation and general approach were considered of little importance.

Opinions on the Value of the Interview. To substantiate further the wide use of the interview, the favorable expression of its value was indicated by a large majority. Fifty-three responded to the request and expressed an opinion as to its value. Following is a short summarization of these opinions:

Opinion of the Value	*No. of Schools*
Of no value in trainee selection..	0
Of little value in trainee selection.	0
Of some Value in trainee selection	19
Of considerable value in trainee selection	34

Table V. Value of interview in trainee selection

A study of the opinions given shows that the interview is rated as of considerable value. It was commonly called the *only real method, the best single method, very important, indispensable.*

Many qualifying remarks were made, however, concerning the danger of the interview when conducted by a teacher or a person not skilled in the art of interviewing.

Tryout Courses. Sixty-four schools furnished information relative to the use of tryout courses as a selection technique. In 21 schools all applicants or enrollees were required to take tryout courses; 23 schools offered tryout courses to applicants and enrollees where doubt existed; 20 did not offer such courses at all. Rotation through several shops was found to be the most common practice in tryout courses, with 35 schools reporting this procedure. Twelve schools stated that the tryout course was given in one general shop.

There was considerable variance as to the length of such courses with a range running from two years to three weeks, the most frequent being between four and five months, although several schools indicated tryout courses up to one year.

Recommendations. The policy of requiring recommendations concerning all applicants was used in 36 schools. Twenty required them of all applicants, and seven of applicants not well known or where adequate information was not available. Recommendations were obtained from the principal of the school previously attended, the industrial-arts teacher, or other school representatives.

Importance of Selection Method. To obtain further information on various methods used in the selection of trainees, the investigator asked the individuals filling out the questionnaire to rate certain items considered important and to add any others that they wished. The following table shows that the ranking of these items closely correlates with the opinions expressed previously.

Item	Number Reporting	Rank
Interviews	60	1
Previous school grades	55	2
Shop tests	50	3
Intelligence tests	59	4
Experience	43	5
Interest inventories	46	6
Aptitude tests	57	7
Recommendations	55	8

Table VI. Rank order of items dealing with selection

The interview was still considered of greatest value followed by previous school grades, shop tests, and intelligence tests. It will be noted that interest inventories, aptitude tests, and recommendations were considered of least value.

Summary. From the foregoing data it appears that there is still a wide difference of opinion among many vocational-industrial school administrators relative to the most desirable and effective practice in the selection of trainees. It is also apparent that the problem of selection is one which is growing in importance in view of the fact that 47 of the schools reported that the number of applicants refused admittance within the past five years had increased, while 43 had a waiting list for admittance. *The increase in enrollment as estimated by 38 schools during this period was 42 per cent.* While it is true that the war emergency has undoubtedly influenced the enrollment during the past year, the figures showed an increase prior to this period.

The selection of pupils appears to be largely in the hands of the principal or director of the school with the assistance of other members of the staff. Most of the schools admitted pupils on a probationary period with a minimum age restriction of either 14 or 15. The major educational requirement for admission was an elementary school education with few schools requiring specific courses or marks. However, many of the schools apparently do not set up any entrance requirements but admit each pupil on an individual basis.

Although intelligence test scores were used by 30 of the schools, and 19 used the scores whenever possible, only 14 required that the applicant attain a minimum I.Q. or critical score. Aptitude tests were used to some degree by 36 of the schools, whereas interest inventories were used only by 7. Although less than half of the schools surveyed were using mental tests, there appears to be a growing realization upon the part of some school administrators that these tests can play an important part in the selection of pupils.

The interview was the most popular technique used in selection. Forty-nine schools interviewed all applicants prior to admission. Fifty-nine per cent said the average interview was held far enough in advance of the final selection to permit deliberation and evaluation.

The value of the interview might be questioned in those schools where all members of the staff are permitted to conduct the interviews. The danger of untrained interviewers who are influenced by their own personal ambitions, likes and dislikes should be recognized.

There was a wide divergence in the opinions expressed relative to the value of the various devices and techniques used, although many indicated a rather clear understanding of the importance of the various selection practices and procedures. The common statement that intelligence tests should be used only along with other devices and that the score made is merely an indication is evidence of this fact.

The fact that an unfavorable attitude was taken in some cases toward both general intelligence and aptitude tests might be due to the following reasons:

1. Persons answering the questions, not having used the tests correctly, got poor results.
2. Lacking complete understanding of the tests, certain persons may have derived satisfaction from criticizing them.
3. Having used the tests for purposes for which they were not intended, certain persons obtained unreliable results.
4. The tests used might have been as unsatisfactory as was indicated by those filling out the questionnaire.

Interest inventories were used to a less extent than aptitude and general intelligence tests. More persons express opinions regarding interest inventories than reported having used such inventories in selection. This would indicate that many of the responses were based on opinion of the general topic of interest rather than on an observation based on experience with the giving, using, and checking upon the results of interest inventories. In any event, from both those who appeared to have used them and from those who were speaking of interest in general, the opinion did not prevail that this measure alone is of great significance. The majority of opinions centered around the idea that if possible, convenient, and economical, the interest inventory should be used as an aid in selection.

It is possible that the lack of objectivity and long common use of the interview, as contrasted to the relative newness of the aptitude and general intelligence tests, account for its wide use as a technique in selection. For persons who have not had experience with the newer techniques in the selection of trainees, there is little left but the interview and the applicant's past school record. It is natural for one to recommend the method which he or she has used.

While the data obtained covers only a small percentage of the vocational-industrial schools in the United States, the indications are that a wide difference of opinion exists relative to the selection of trainees. With the increased demand being placed on industrial schools, it is apparent that they must limit their enrollment to pupils who can profit most from the training given and thus save both human effort and public funds. Industrial education cannot continue to be negligent on this vital matter of admission.

"At the present time one of the disturbing problems concerning the various vocational fields is the absence of an adequate admission policy.

"In order to aid the pupil in making a wise selection the school, in addition to offering introductory survey courses, should establish under competent supervision a testing program which will reveal the native and acquired characteristics of the pupil. The school should use a scientific basis of selection rather than merely rely on the pupil's desire, which by itself is an inadequate guide."[2]

The day when one in a responsible position in industrial education is allowed to observe abstractly and make predictions irrelevant to practical procedures is nearing an end. Workers in the field must acquaint themselves with the facts of psychology. They must use, in addition to superficial judgment, all the knowledge now available of aptitudes, abilities, traits, and characteristics and their relation to vocational success. Although attempts at determining the relation of certain attributes to vocational success might yield negative or near negative results, they should not be discontinued. Through such efforts foundations are laid for further progress in vocational education.

[2]Norton, Thomas L., *Education of Work*, The Regents' Inquiry (New York and London: The McGraw-Hill Book Company, Inc., 1938), p. 138.

SO YOU WANT TO BE A PRINTER

So you want to be a printer
And work with type and ink,
But you're not sure if you ought to,
And you're asking what I think.
Well, printing's been around a while,
Five hundred years or more,
And the famous men who've followed it
Must be counted by the score.
But it isn't history that you want,
It's facts 'bout pay and such,
For a trade that don't let you live well
Cannot be worth so much.
The starting pay is kind of small
For you begin by cleaning shop,
But forty hours bring you 55
When you've landed at the top.
You must stand on your feet all day,
And your eyes must sure be keen
To pick out every detail
In a proof that's not too clean.

Your spelling must be doggone good,
And your grammar "right there" too,
So you can straighten out the stuff
That people hand to you.

If you've got all that, and can stand routine,
Then you'll like this trade my son,
And liking the work is half the fight
And most the battle won.

— Leonard E. Schmidt
Lincoln Hall Vocational School,
Lincolndale, N. Y.

Facts, when combined with ideas, constitute the greatest force in the world. They are greater than armaments, greater than finance, greater than science, business, and law because they constitute the common denominator of all of them.

— Carl W. Ackerman

Kaiser's Localized Visual Education

D. T. HOXIE*

The use of strip films for vocational education has been localized by Kaiser Company, Inc., at their Portland tanker building yard to meet the requirements of the prefabrication methods of construction employed by the firm. The idea of localizing strip films was conceived by Maurice Bullard, supervisor of vocational training for the Kaiser Company in the Portland area.

Where general vocational education films leave off, the special productions used in Portland are designed to give workmen the benefit of complete knowledge of methods being used in this yard. The regular commercial films cover many subjects, some of them acceptable, others, due to the nature of the work involved, are not applicable to the Kaiser method. Working closely with Lorrin Andrews, another vocational education supervisor, Bullard arranged to procure the services of Leonard Delano, materials supervisor and photographer.

Delano goes into the yard and takes Speed Graphic photographs of actual operations, step by step, and then processes them onto 35mm. motion-picture film.

The true value of this type of instruction was appraised by one production superintendent who made the statement that "the strip films taught as much in a shorter length of time than do actual demonstrations in the yard." Delano so arranges his film that every facet of the operation from beginning to end is demonstrated. This method of presentation gives to the craftsmen a picture of detailed operations of their own work.

A demonstration of this idea is found in a strip on material expediting. In this particular sequence of pictures, the material is shown arriving at the yard, being placed in proper storage bins, marked with the mill mark, and then on its devious route to its ultimate use in tanker construction. Thus the material expediter learns how the material is handled by the various pieces of equipment and has a better over-all picture of the work done by others prior to the time he takes charge.

*Portland, Ore.

Taking pictures for the visual education program

These films are not only used in the trainee program, but are also in regular use as refresher courses for leadmen in the yard. The department heads assign to classes the keymen of their departments to take a course as a refresher and as a method of presenting new ideas and methods of operation.

Inspecting the strip films to be used for the visual education program

Under the lecture system, it is oftentimes possible for the lecturer to wander from the subject in the presentation. By using the visual education system, he must cover every main point adequately as the points are projected on the screen. Similarly, the use of strip films offer an opportunity for open forum discussions and exchange of ideas on methods employed. In some instances, these forums have brought forth short cuts that have materially decreased the amount of time in ship construction. The vocational education department at Kaiser's Portland yard is housed in a special building erected for the purpose, complete with classrooms, auditorium, and conference rooms. Another building houses the training school for welding, where interested persons may learn ship welding. It is interesting to note that the graduates of this school have largely contributed to the record-breaking productions of the Kaiser yards.

Classes other than welding are held for all crafts on regular schedule, generally two hours a day, three days per week, and are attended by the workers on their own time. Trainees are paid while they are learning their crafts on the job.

The visual system of education has another outstanding quality that is primarily of interest to workers engaged in war-production activities. The government has certain construction specifications that must be adhered to and their inspections are very rigid. Using strip films, it is possible to demonstrate to the class these exact procedures necessary for passage of inspection.

The plan adopted by Mr. Bullard and instituted at the Swan Island yard has pioneered a new field of instruction on shipyard techniques, and already requests have come in for full details and copies of prints that are applicable to other yards.

An Armed Forces Induction Station as a Referral Point for Vocational Rehabilitation

L. J. LENNON*

Newspaper articles have made known that more than 2,800,000 men between the ages of 18 and 38 have been examined at Army induction stations in the United States and have been rejected for the armed forces because of mental and physical defects. Some of these stations are located in areas where there is extensive trade and manufacturing, most of which is now devoted to war production. Many of these men have returned to jobs in which they are working at a level below their true ability because of physical defects that make satisfactory performance difficult. In other cases the employee believes his ability to gain a more skilled and better paying position is interfered with because of physical inability.

In general there are three groups of cases handled by state vocational rehabilitation agencies. These three groups arise because of physical defects such as musculostructural defects, amputation of limbs, heart trouble, tuberculosis, visual and auditory difficulties. Employees needing vocational rehabilitation can be divided into cases where: (1) the defect is a direct hindrance to employment, (2) the defect is such that the employee cannot be placed directly upon a necessary defense job, (3) the unskilled employee is interested in learning an occupational skill or a new process in his trade. Heart trouble would be a direct hindrance to an employee fit only for construction labor. A recently amputated leg may mean that the employee cannot stand at his lathe all day, but must remain unproductively idle until trained to use artificial limbs in a new job. Visual defects may keep a machine operator from learning to use fine measuring instruments or to do layout work in his trade. Lack of visual acuity stands in the way of further vocational advancement in the machine trade, but may not be such a handicap elsewhere.

It is the function of the state rehabilitation offices in certain of these cases to make job retraining possible. This is often done on the job with the cooperation of the employer. In other cases new employment better adapted to the needs of the individual can be secured. In all instances the vocational rehabilitation bureau works in close co-ordination with the United States Employment Service. In an industrial community the vocational rehabilitation bureau can aid in job placement of idle labor in this time of need for workers. It can help increase the productivity of some employees by retraining and can aid in making a personal adjustment for the ill-placed worker.

One Armed Forces Induction Station located in Pennsylvania has taken a definite part in making known to selectees rejected at the station the function of the Pennsylvania State Rehabilitation Bureau. This was done outside the regular line of duties. When a rejectee had completed his physical examination and the cause of his rejection for the armed forces was

*Formerly, Guidance Counselor, Technical High School, Scranton, Pa.

made known to him, he was tactfully drawn into a conversation concerning his employment. In this interview an attempt was made to determine the kind of work done by him, whether or not the physical disability made his work difficult for him or whether or not he was satisfied with his employment. Many cases did not seem suitable for referral to the bureau, but others were apparently of a kind that could receive the service extended by the rehabilitation agency.

The state vocational rehabilitation agency was described in full to the latter cases. It was pointed out how the bureau might be of help. If the selectee seemed interested, he was asked whether or not he would like to have the bureau agent visit him. The interviewer then helped the selectee to fill out a simple form giving an appraisal of his situation and requesting a consideration of his case. It was also made known to the draftee in clear and lucid language that this service was not a part of the regular army induction procedure and it was requested voluntarily by the selectee.

Applications for the vocational rehabilitation bureau were sent to the local United States Employment Office. A representative of the Pennsylvania Rehabilitation Bureau received the applications from the employment office and in turn gave them to the rehabilitation agent in the applicant's home county.

An alternate procedure may be used in having the applications sent to the central office of the rehabilitation bureau for distribution to the proper agent, who would in turn work with the employment office in the city where the applicant lives. This system may be preferable where a larger number of counties is served by an induction station.

The passage of large numbers of employed men through induction stations presents a situation whereby those not fit for military service can become acquainted with an agency trying to bring about better individual vocational adjustment. It is a kind of service unknown to many with disabilities. The station is an ideal referral point and should be used more extensively.

A War Training Course for Teachers of Glider Construction

LYNN A. EMERSON*

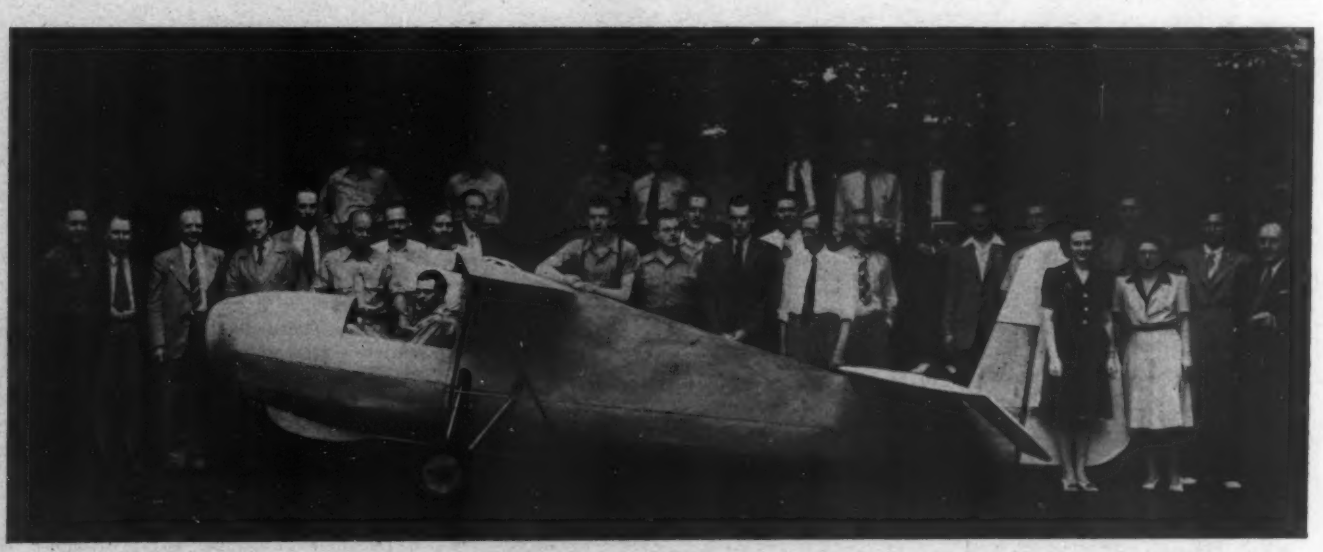
In the spring of 1942 the interest in glider construction on the part of industries in New York State appeared to warrant the establishment at Cornell University of a summer training program for teachers who could be used for war-training classes. Regular industrial-arts teachers, some of them with many years of experience, were recruited for the program. A staff of glider specialists was gotten together, and plans were laid for a course which provided both shopwork and the necessary related theory. This article presents a brief description of that program.

*Director, National Defense Curriculum Laboratory, Sibley Dome, Cornell University, Ithaca, N. Y.

It would be presumptious to state that every industrial-arts teacher would become proficient in glider construction in a summer session program of eight weeks' duration. Nevertheless a great deal can be done in that length of time with a group of interested teachers who already are good woodworkers, and who have a real desire to learn glider building.

Wood-fabric glider construction requires precision woodworking, the quality of work required in fine cabinetmaking. Yet glider construction embodies certain fundamental principles and practices not found in fine cabinetwork or patternmaking. In these fields relatively little attention must be paid to those surfaces which are hidden and unfinished. The weight of the product in relation to its strength is relatively unimportant. No national standards have been set up which specify materials and procedures, and no regulating body inspects the product to make sure that it conforms to these standards.

Glider construction, however, is hedged about with many regulations. Specifica-



The class and the finished ground trainer

tions are set up for wood, fabric, glue, and other materials. Many procedures are specified, for the making of joints, the mixing and use of glue, and many other items. Dimensional tolerances are close. Finish specifications are exacting. And the Civil Aeronautics Authority stands guard over all these elements in any glider that is to be licensed for flight.

Many difficulties were encountered in setting up the training program. Materials priorities had begun to make themselves felt. Plans for a licensed glider of a type that could be built in the time available could not be obtained. And so it was decided that under the circumstances the best procedure would be to design a glider ground trainer which would embody many of the construction features of approved gliders, and to build several of these ground trainers. The construction of the ground trainers and their operation are described in other articles in this series.

The course consisted mainly of shop-work, with one hour given to glider theory, and occasional shop talks taken out of the eight-hour day. As most of the trainees were relatively unfamiliar with the principles of operation of gliders, it seemed desirable to cover these principles in a series of class sessions. These included elementary aerodynamics, types of gliders and their uses, C.A.A. Regulations, glider materials, and construction processes. As the trainees were already skilled in the use of hand tools and woodworking machines, no time was given to these items except in their application to procedures which were special to glider construction.

Gluing up the parts

The ground trainer used as a project for this course was designed to use noncritical materials, with the exception of plywood and glue. It was necessary to provide training in the handling of plywood, and the use of glues approved by the C.A.A. These materials were embodied in the design. During the course two ground trainers were completed, a third was nearly finished, and some of the trainees were given opportunity of doing repair work on gliders obtained for that purpose.

During the construction of the first ground trainer, and growing out of its try-out after completion, many suggestions for improvement were made. These were embodied in the later trainers. At the close of the session the trainees were given opportunity to sit at the controls of the ground trainer behind the tow car, and to get firsthand experience in its operation.

Constructing the rudder

The course appears to have stimulated interest in glider construction in the state, and to have provided the industrial-arts teachers in the course with sufficient training to undertake programs in their own schools during the following school year. The course could have been improved greatly if adequate instructional material in the form of job sheets had been available at the beginning, if a more suitable field could have been secured for trial runs of the ground trainer after its completion, and if the course could have been supplemented with work on the construction of actual gliders.

We ought to be able to devise shop records as definite and continuing as track records. There certainly is something in every shop comparable with the distance a shot has been put. No one will name it and exalt it if we do not. And, as we select the winners of shop events, let us be careful that we acknowledge specific, measurable performances rather than general excellence. — *Homer J. Smith.*

Deliberate slowly, but execute promptly the things which have appeared unto thee proper to be done. — *Abraham Lincoln.*

Army Driver Training

HARRY H. PENCE*

The title of this article sounds simple, but in reality it means far more than the average person realizes. To get some conception of what driver training consists, let us start at the beginning and see what happens as Private John Doe reports to his superior officer or civilian instructor for driver training. Objective: his blue card which the Army furnishes every qualified driver passing the required exam and skill tests.

This examination and the tests are the most important of the whole program, because they disclose the student's ability to react, his co-ordination — his steadiness, and most important his eye condition — broadness of vision and visual acuity; this last taken by a medical officer at the hospital. No doubt you will be interested to know that no small percentage are failed before completing these tests.

Recently a group of 25 civilians were put through the series of tests given according to Training Circular 67, and 60 per cent of them were unable to qualify. Yet of this same group all had state operators' licenses, permitting them to drive — some with restrictions, such as glasses, extra mirror, and the like.

In mentioning that 60 per cent of civilians were unable to qualify as Army drivers, there is no intention to cast reflection on the state procedure in examining drivers for operators' licenses. For civilian travel, in pleasure cars, these men no doubt were qualified. But when we consider the Army driver we must also consider the tactical and administrative vehicles he drives, and as you will readily see, there is a vast difference, and a real need of special training both in operation and preventative maintenance.

In the Army we have regularly scheduled steps the driver goes through in handling his vehicle — before operating in the morning, warming up procedure, checkup of instruments, tire check to maintain proper pressure schedules, lights, horn, windshield wiper, and other items of inspection. There are 30 in all which have to be inspected each morning and evening.

During any halt, the driver also checks oil level, gas gauge, water in radiator, and, of course, while riding he keeps glancing from time to time at instruments to see that the battery is being charged, temperatures and gas level are O.K., and he listens for unusual motor, transmission, or differential noises.

To keep the vast fleet of Army vehicles moving requires constant care and attention from the commanding officer to the private in the rank who is the driver or company mechanic. This is important as the Army is the largest operator of motorized equipment in the world.

What is this difference, you might be prompted to ask, in types of trucks, jeeps, and the like? They all run, some on four, others on six wheels.

Let us take a Prime Mover. This splendidly engineered piece of equipment, one of the world's finest, costs your government in the neighborhood of $7,500. It is no doubt one of the most powerful units used by the Army. It has four sets of levers, plus emergency brake; transmission lever; P.T.O. winch control; transfer case, high and low range; and front-wheel engagement (front-wheel drive).

Among the instruments are: the air brake control lever; tachometer (engine r.p.m.); starting battery gauge; air pressure gauge; ammeter; oil pressure gauge; viscometer (telling oil condition and viscosity); temperature gauge; fuel gauge; light switches; speedometer; and choke, throttle, windshield wipers.

Foot controls: clutch, foot accelerator, air brakes, which are applied gradually, and dimming switch for headlights.

His vehicle is 8 ft. wide and 22 ft. long, and he may be hauling a trailer or weapon behind the unit itself which is approximately 35 ft. long, making a possible overall length varying from 55 ft. to 70 ft.

He must know how to operate his vehicle under all conditions, on mud roads, macadam, or concrete. He must have an uncanny feel in turning or backing, and he must have unusual reaction response because this equipment may mean the difference between victory or defeat.

He also must be quick and keen of perception, have a thorough knowledge of his equipment, and must possess a knowledge of nomenclature of parts so as to be able to report any repair needs.

He is assigned to the vehicle and has an assistant, and before he goes to bed at night, he must see to it that his equipment is ready to roll at a moment's notice even though he might have to spend an hour or more checking his vehicle before he retires. He must be trained to operate the vehicle safely; conforming to state, municipal, and government regulations. Besides this, he must be courteous, and at all times be ready to anticipate what you or I as civilians might do should he encounter us on the road.

He must further be able to operate efficiently by day and by night — with blackout lights if necessary. In a recent southern maneuver 13,000 vehicles of all types operated under actual war conditions — fording streams, climbing steep hills, bivouacking at night, camouflaging equipment — and yet the accident ratio, none of which were of a serious nature, was less than 1 per cent.

Some of the vehicles used by the Army have as many as 12 universal joints; they have transfer cases, winches, front-wheel drive, and the like, and the Army drivers and mechanics who are so vitally needed for our success in this all-out war must learn all about them in a short space of time.

From early morning until late at night in the training school and on the road, he studies, listens to lectures, and sees through the medium of slides and motion pictures, the things he is expected to know and do.

He must learn all about state laws, courtesy, safety, convoy procedure, and servicing his vehicle, besides being able to drill according to Army FM-25-10.

The training which he gets will make the Army driver a good man to hire after this war is over. He will not only know how to drive correctly but he will also know how to take care of the vehicle so that it will deliver him plus the load to a designated spot.

*Principal Automotive Adviser, Motor Operation and Advisory Branch, Supply Division, U. S. Army, Sixth Service Command, Chicago, Ill.

INDUSTRIAL ARTS FOR THESE TIMES

J. I. Sowers*

Industrial-arts work will make great demands upon the initiative and originality of its teachers during these troublesome times. Shop teachers cannot hope to continue the more or less static courses used during normal times. They will have to adapt their work to the demands of the national crisis. This means that the work will have to be changed at times, and perhaps entirely, because materials, tools, and the things formerly thought necessary to industrial-arts work will no longer be obtainable.

Lacking materials, careful planning will have to be applied to the development of new courses, probably along the line of industrial relations, vocational guidance, study of industries, making good on the job, personal finance, blueprint reading, estimating, mathematics adapted to industry, industrial science, illustrated lectures, and so on through a long list that will readily suggest itself. It will likely prove true that a year developed to meet the present emergency will be the most profitable and useful year in the educational experience of most shop teachers.

*Director of Industrial Arts, Miami, Fla.

Industrial-Education Needs as Seen by Industry

VERNON OLSON*

Industry today finds the supply of skilled men exhausted. From my experience, of 25 people who come off the street seeking employment, perhaps one, or two at the most, have a skill which can be utilized in the metal trades.

You might think that with the war well past its first phase, the need for training has lessened. Idle statements have also been made that we can slow down the production of capital tools, because we have saturated the market. Neither is true, because even the initial task of retooling American industry for war production is not yet complete. The machine tool industry, as a whole, has a backlog of millions of dollars. This represents peak production for months to come.

If we still don't have the capital machines, it is obvious we don't have trained skill to operate them. What good is a capital machine without a trained operator.

The company with which I am associated manufactures the Doall machine. We pride ourselves in its excellence, but that excellence must be coupled with a trained machine operator. To this end we conduct a six weeks' training school.

At a session I attended recently in Washington, I was informed that it is easier to get a stenographer than a typewriter. That is not the case in industry.

Personnel directors throughout the nation are uniting the resources of the community and of the government to the end of training and upgrading workers to promote the war effort. The shop teacher must accept a proportion of the job of training the young men who today are in high school. The majority of this youth tomorrow will either be in the armed service or in the great army of production.

In the last war there were seven men behind the lines to support one soldier at the front. In this war of production the figure is double that number. The United States must do, as it were, overnight, what Germany has been preparing to do for 11 years — and Japan for perhaps a century.

Industry recognizes that there are three groups to be trained.

1. *The present employee.* He must learn new or higher skills every day as a result of engineering changes, new machines, new types of jobs, new and higher inspection standards, promotions, transfers, and all kinds of new production requirements.

The employees who were taken on by industry in the past two years are not all working up to standard. Could training help solve some of their problems? Has your school then gone out into the community, into industry, and helped train these present employees?

2. *Hundreds of thousands of new employees must be trained.* Women will leave their household duties. Men will quit the insurance business. The brickmason will enter the factory. The gas attendant will be operating a drill press.

These people represent the great training problems and the schools can be of vital help in the training of new employees.

3. *An unknown number of displaced employees in defense industries must be transferred to active war production.* They must be trained to do, in many cases, totally different kinds of work.

Along with them we place the auto mechanic, who is accustomed to working with tolerances of .006. The antiaircraft gun requires a tolerance of perhaps .0005.

The lathe operator, who has been working in a washing-machine factory, finds tolerances in a defense plant much closer than he has known.

This creates a third training problem in the solution of which the schools can participate.

Here are some training needs as seen by industry.

Ordinarily we would admit that it is the function of the school to prepare young citizens for future useful occupations without the artificial barriers of choice of occupation. Ordinarily we would admit that the job of munitions makers is to fit men quickly and effectively to carry on defense work.

Even as the administration has set aside laws and procedures that were in effect in peacetime, so the schools must unite with the manufacturers and munitions makers with one purpose in mind — to train men and women to perform their task for the speedy winning of this war.

Now what are some of the things that industrial teachers can do to further this training program? It is evident that we must prepare youth to live in a "Power Age." The basic elements of this type of training are to develop in the student the ability to give sustained attention, to analyze each job as it presents itself, and to react correctly and promptly.

Development and refinement of these necessary traits are indispensable for future success. To achieve this we must do away with extraneous curriculum routines, and devise methods permitting a direct approach rather than a lengthy abstract treatment of the subject. The student's interest must be aroused and he must be made to see the absolute necessity of paying strict attention to the job. He must acquire the habit of exact observation, perhaps through reading blueprints, and must be able to distinguish between the essential and the nonessential.

The employer is not interested in your training the worker in specific jobs, or in trying to keep up to the changing trends or demands of industry. The best vocational tool to meet a universal need is the ability to act understandingly, having been informed by word or reading. Getting things correctly the first time is the very essence of good management. Spoilage, waste, and lost time are thus avoided.

Most employers recognize that education is a continuous process, and that is why we train on the job. In the United States there are approximately 28,000 distinct occupations subject to classification, and it is idle to think that the schools — to any noticeable extent — will relieve industries of its labor responsibilities and necessities in the field of specific vocational training for power jobs. Most occupations require some special training that can be gained only through experience. There is a distinct job for the school, however, and any school that has an industrial program that is not as yet geared up for the World War pace had better attend to getting in line at once.

*Production Manager, Contour Saws, Inc., Des Plaines, Ill.

The major objectives of the laboratory of arts and industries are:

To further the boys' interests and understanding of modern industry, its materials, processes, and the social economic life that results.

To give each boy an opportunity to follow his special industrial interest and to learn advanced operations and skills typical of modern practice in the trade or industry.

To develop consumer intelligence in the selection, care, and safe use of the products of modern industry.

To develop wholesome leisure-time interests in craftwork and industrial processes.

To give an increased appreciation of the place of design in machine-made products.

To vitalize training in all instructional areas of the high school curriculum by giving opportunities for learning through real experiments with materials and tools.

— *William H. Johnson*

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

John J. Metz, Editor

Postwar Planning

While it is impossible to predict what postwar conditions will mean to the school shop, or to the courses taught therein, it is quite safe to draw a general picture of what will confront industrial arts and vocational education after this war is over.

It may be assumed, of course, that educational administrators will not forget the valuable services which industrial arts and vocational education have and still are rendering in preparing inductees who are about to assume their places in the ranks of the armed forces, or in training inexperienced workers to enter war-production plants, or to retrain old mechanics to resume work which they had dropped years ago.

Human memories are not to be relied upon, however, and since it has happened before that when money for educational purposes was hard to get, the relatively more expensive shop classes were discontinued, it is time now for industrial arts and vocational education shop teachers, supervisors, and directors, through their state and national organizations, to exert every effort to consolidate the gains made up to now.

The true worth of the educational value of the work in these practical fields has never been recognized so thoroughly as it is right now. Yet even now there are forces which are undermining the gains that have been made. Teacher shortage is making it more and more difficult to maintain even those classes in which workers for the war-production industries are trained. For the same reason many industrial-arts classes have had to be discontinued or turned over to inexperienced teachers.

Under these conditions the work cannot help but lose some of its appeal to the students and some of its more apparent value in the eyes of parents, industry, labor, and taxpayers. It is imperative, therefore, for those who are still teaching in these fields to do their utmost, in order that the future of this type of education may be assured.

Much of our school shop equipment is in need of replacement right now. Under present conditions, it is practically impossible to do anything about this, but if the work in these shops is to be worth anything, that item of replacement must be stressed just as soon as there is any likelihood that tools and machines can be diverted without endangering war production.

Plans must also be made, so that at the proper time pressure can be placed on schools and school systems that have dropped their shop classes so that these may be revived when teachers are again available. We are fighting a mechanized war now, but after that war has been won, we will enter another era of scientific, mechanical, and electrical inventions, which will also require an adequate education for those who live in that type of society, and industrial arts and vocational education can surely not be ignored.

We do not have to plan just what our offerings are to be when peace comes, but we must and can anticipate some of our requirements as to equipment, materials, and supplies needed, what changes we deem necessary in our instructional material and in the outline of instruction, how we want to modernize our shops and the projects that are made therein, and we ought to be ready to suggest what new materials and activities ought to be added to our present offerings just as soon as the longed for close of the war arrives.

Vocational Rehabilitation

The establishment of the new Office of Vocational Rehabilitation in the Federal Security Agency to administer the federal state civilian rehabilitation program under the Barden-La-Follette Act of July 6, 1943, gives an added impetus to the improvement and expanding of the rehabilitation work hitherto offered by vocational education.

The work already accomplished in the rehabilitation field undoubtedly deserves great credit, but under the new law it will be made still more effective because the program provides that remedial treatment may be given when necessary. This means that job training may now be given to some who would have been unable to profit by it in the past, because of physical handicaps which now may be rectified by medical treatment. In this way more workers may be prepared to take their place, or resume their work, in the war-production industries.

This new program also contains provisions for rehabilitating persons injured in nonmilitary war services, such as those disabled while serving as unpaid volunteers in the aircraft warning service, in the Civil Air Patrol, or as members of the United States Citizen Defense Corps. It also covers those who receive injuries while serving as members of the crews of vessels owned or chartered by the Maritime Commission or the War Shipping Administration.

The expenses incurred by the states in the rehabilitation of these war disabled civilians will be paid by the Federal Government. Federal grants also will cover the entire administrative cost of approved state vocational rehabilitation programs for these disability cases and half of the expense for rehabilitating other than war disabled civilians.

The control of these programs will be vested in the State Board of Vocational Education. The Veterans' Administration will, of course, provide vocational rehabilitation for all those who receive their disabilities while serving in the armed forces.

The work of the rehabilitation classes is especially satisfying to both the teachers and the schools, and with this legislative inducement it is hoped rehabilitation work in the vocational schools will make greater strides toward the goal of perfection.

The Coming A.V.A. Convention

The A.V.A. Convention will be held this year at Chicago, Ill., December 15–17.

The importance of this annual gathering should not be overlooked. Attendance at this convention is not to be looked upon as a picnic. The general and the sectional meetings are always well attended, and their importance can be adjudged by the theme that has been adopted for this year's conference — "Gearing Vocational and Practical Arts Education to Wartime and Postwar Needs."

Now is the time to make your attendance plans.

Establishing Store Relationships for a Cooperative Program of Distributive Education

MURRAY BANKS*

In organizing a program of vocational distributive education, the problem of securing proper cooperative contacts with the stores is one of the most important considerations with which the co-ordinator is confronted. To place pupils in a cooperating store where but little opportunity for training exists represents a waste of effort for both the school and pupils.

This article will discuss how this problem was met in Millville, N. J., when it was decided to organize a George-Deen program of vocational distributive education. In considering this problem, the following topics will be discussed: (1) cooperative store requirements, (2) standards for cooperative jobs, (3) types of cooperative stores selected for participation, (4) individuals responsible for selection of stores, (5) procedure whereby a store becomes a cooperative store, (6) problems encountered, (7) nature and form of cooperative agreements, and (8) the advisory committee.

Cooperative Store Requirements

In order to select worth-while training agencies from among the stores in the community which were willing to participate in the cooperative program, certain standards were established. It was attempted to select stores which were in charge of managers:

1. Who have a recognized standing in the community.
2. Who accept the plan for the advantages it has for them as well as for the school and pupils, and do not regard it as philanthropy on their part.
3. Who are so organized as to be able to absorb the part-time pupils upon the completion of the course.
4. Who are willing to agree to the following:
   a) To rotate cooperative pupils through the various phases of the work of the store.
   b) To pay wages on the sale scale fixed for full-time inexperienced workers.
   c) Not to employ pupils on full-time until they are graduated, except with the consent of the school authorities.
   d) To join in conferences with other firms and school representatives for the discussion of immediate problems.
   e) To give the directing agencies permission to inspect the work of pupils in the store or in the office.
   f) To make periodic reports to the proper authorities on the work of each individual pupil worker.

*A. S. Beck Shoe Corp., New York City.

Standards for Cooperative Jobs

Certain definite qualifications were set-up for the type of working experience for which credit would be granted. The careful selection of jobs within the stores is as important as the selection of the stores themselves. The following requirements were established for cooperating store positions in Millville:

Cooperative Job Requirements

I. General Standards

1. The job must provide a training program which includes various kinds of merchandise experience.
2. The experience should insure acquisition of skills and knowledges needed in selling and store work.
3. The work should include contacts with, or service to, the customer.
4. The organization must be one commonly accepted in the field of distribution or merchandising, e.g.: retail stores, wholesale concerns, specialty goods, house to house distributors, and personal service organizations.

II. Kinds of jobs for which credit is granted (this list of jobs conforms to the federal definition of distributive occupations, training for which is reimbursable).[1]

1. Managers and operators of all kinds of stores, shops, and other businesses:
   a) Retail stores of every kind: grocery, meat, furniture, apparel, hardware, drug, dry goods, general merchandise, etc.
   b) Wholesale stores
   c) Jobbing and commission houses
   d) Cooperative organizations: retail, wholesale, and agricultural
   e) Commercial service businesses
   f) Personal service businesses: laundries, dry cleaners, garages, beauty parlors, etc.
   g) Independent artisan shops: repair, handicraft, printing, milliners, jewelers, etc.
   h) Contractors dealing with consumers: electrical, plumbing, building, etc.
   i) Small factories selling direct to consumers
   j) Hotel, restaurant, recreation, and amusement businesses
2. Managing agents: branch managers and other local representatives of all kinds
3. Apprentices and learners in training for managerial positions in stores
4. Department heads, supervisors, and foremen in stores:
   a) Commodity departments: buyers for dresses, men's suits, meat, cigars, etc.
   b) Service departments: delivery, restaurant, etc.
5. Purchasing agents and general buyers of all kinds for:
   a) Retail and wholesale stores
   b) Cooperative organizations
   c) Industrial, commercial, and personal service organizations of all kinds
   d) Agricultural products
6. Sales managers in all kinds of business
7. Salespersons: sales agents, canvassers, solicitors, demonstrators in:
   a) Retail stores of all kinds
   b) Wholesale, commission, jobbing organizations
   c) Industrial organizations: industrial salesmen, specialty salesmen, etc.
   d) Commercial services: canvassers, solicitors, realtors, life underwriters, etc.
   e) Transportation, communication, and other public service organizations
   f) Personal service businesses: laundries, cleaners, garages, etc.
   g) Hotel, restaurant, amusement, and recreation businesses
   h) Farmers' markets
8. Store service workers in contact with customers: cashiers, adjustors, collectors, etc.
9. Delivery men of all kinds:
   a) Delivery salesmen: milk, ice, laundry, etc.
   b) Retail and wholesale delivery men
10. Miscellaneous: auctioneers, newspaper venders, waiters, stewards, and organization housekeepers

[1] Distributive Education, *Vocational Division Bulletin No. 211*, Federal Security Agency, U. S. Office of Education, 1940, pp. 4–5.

Types of Cooperating Stores

The important criterion in the selection of a store for training purposes is not necessarily a consideration of the particular type of store, such as department store, independent grocery store, or chain store unit, but rather the opportunities for valuable store training which are offered the student.

It was the aim in Millville to secure as cooperating stores as wide a variety of types as possible rather than being limited to any one type of store. It is believed that the smaller retail stores often offer as good facilities for developing competent well-trained sales help as do the larger units.

If the student had abundant opportunity to deal with the public directly or indirectly, to observe and participate in a desirable sequence of retail practices, then the training agency was acceptable. Stores which offered many opoprtunities to meet and handle the public in the performance of one's duties were preferred to those stores where selling efficiency is not an es-

sential requirement, such as self-service food stores, supermarkets, etc.

Practical experience on the job is valuable not only because it gives one training in the performance of the duties of the job, but also because it permits one to meet different types of people, to form valuable personal associations, and to familiarize oneself with store policies and with the standards of doing business.

During the first year of the program, one of the cooperative trainees was employed in a firm owned by his parents. It is planned, however, to discontinue the practice of assigning trainees to cooperative work where the parent must necessarily evaluate the work of the trainee. The average parent is not as critical nor as impersonal in judgment in employing his own children as is the outside employer. Parents excuse weaknesses, grant requests to attend school activities when a student is scheduled to work; in short, the job requirements are much less exacting than with other employers.

Table I shows the total number of pupils working in each type of store.

Individuals Responsible for the Selection of the Cooperating Stores

The co-ordinator, in conjunction with the superintendent of schools and the principal, was responsible for selecting the cooperating stores who were to participate in the program.

TABLE I

Types of Stores and Total Number of Pupils Working in Each Type

Type of Store	*Total Number Working in Each Type*
Variety	10
Clothing	3
Grocery	3
Department	2
Service stations	2
Furniture	1
Men's furnishings	1
Specialty	1
Shoe	1
Fuel and ice distributing	1
Ice-cream and soda dispensing	1
Total	26

"It might be argued that the Retail Merchants' Bureau or some other such organization should take the lead in the selection of the cooperating stores. In many instances, however, an association is not in a position to do this, since so many kinds of stores belong to such an association, that selecting certain stores and not others might create ill feeling within the organization itself. Under such conditions, about the only thing the school authorities can do is to set up their own standards and assume the responsibility for selecting the cooperating stores."[2]

[2]"Cooperative Training for Retail Selling in the Public Secondary Schools," *Vocational Education Bulletin No. 186*, U. S. Department of the Interior, Office of Education, 1936, p. 98.

Procedure Whereby A Store Becomes A Cooperating Store

The stores qualified to participate in the cooperative training program were discovered largely through the contacts and inspections made by the co-ordinator. The president of the Retail Merchants' Association consulted with the co-ordinator and suggested the names of stores and employers that might be visited. The entire plan was then explained to those visited, and the details of what cooperative placement and training would involve, together with its implications to the store and the trainee, were carefully discussed. In this manner the stores were evaluated by the co-ordinator to ascertain whether the standards previously outlined were met. A form was later mailed to those in charge of employment in the stores which were accepted as cooperating stores. The merchant was asked to indicate on the form the number of cooperative trainees desired, the beginning wage to be paid, and other questions of immediate concern.

A letter and a form which further reminded the employer of the purposes of the cooperative training program were mailed to each employer shortly after the check on the positions. Thus the attention of the employer was again drawn to the importance of the training the student would receive in his organization, and the follow-up visits which might be expected.

Problems Encountered in Establishing Standards for Cooperating Stores

No serious problems were encountered in establishing standards for cooperating stores in Millville. The problems which co-ordinators generally face arise from the failure of most employers to see the need for aiding their employees to become more proficient; in brief, their opportunities and responsibilities for training their employees.

"Many merchants are not interested in increasing the efficiency of their salespeople, and so believe they are doing the schools a favor in employing student workers. They are interested only in getting routine work done, not in providing educative store experiences; they want contingent workers from the high school when they need them and are not interested in seeing that these youth become competent salespeople."[3]

The merchants in Millville were thoroughly convinced, however, of the value and the need for such training for Millville youth. It was not difficult, therefore, to convince them of the need for supplying the student with the proper experience in kind, amount, or sequence. It should be recognized that it is quite a temptation for some merchants, after a student has become farily efficient in some phase of the work, not to change her to a new type of work but to seek profit by her proficiency.

[3]*Ibid.*, p. 99.

A real problem, however, was that of securing enough time to see that the standards were maintained. Unless the co-ordinator has the time necessary for extensive store visits, exploitation of the student may take place by the nonobservance of the standards set up.

When the students are employed with small stores or small unit chain stores, where the policies and practices of the store are well known in the community, it is comparatively more simple to maintain uniform practices in handling student workers and overseeing the practices in the stores in which they work.

Nature and Form of Cooperative Agreements

In any form of worth-while cooperative training, the part played by the store or industry is just as important as the part played by the school.

It is essential that certain things be decided upon concerning both the school and store training for cooperative students in order that there be no confusion or dissatisfaction. Some of the factors which should be considered are as follows:

1. The wage to be paid these part-time workers by the stores should be decided upon.
2. The positions should be those needing extra workers that ordinarily would be filled by new employees.
3. Merchants should look upon this high school group studying retail selling as the first source of supply for the new positions within the store.
4. Students should be assigned to stores at the time, hours, and days or parts of days and months, when these workers are most needed by the merchants.
5. The merchant, or his representative, should be a member of the advisory committee of the retail selling course and should consider attendance at its sessions vitally necessary.

Wages for Cooperative Students

Although a uniform wage has many advantages, there are different grades of stores, requiring different degrees of ability with corresponding compensation, just as there are different requirements in departments in any large store. Since a variety of stores each on different economic levels in Millville were considered for participation in the program, it was not possible to standardize the wage rate to be paid cooperative workers. Stores unable to pay rates which a more prosperous store was willing to pay, nevertheless possessed desirable training facilities. The problem of wages for cooperative students was therefore solved by getting merchants to agree to pay student workers at the same rate they were paying other hired help performing the same duties. Students received between 20 and 30 cents per hour.

It is not difficult to justify the payment of the prevailing rate to a cooperative worker when the cooperative plan is found-

ed upon the understanding that a store will employ students to do work that needs to be done, that students shall be capable of doing this work, and that the store will pay for the work that is done.

One of the disadvantages of a nonuniform wage rate is that it causes discontent among students who are paid a lower wage than their classmates in other stores. Such a situation may cause the student to feel that he has been discriminated against. This problem was effectively handled, however, by explaining to the student that, although his wage rate was lower, the essential objective most profitable to him in the long run was the securing of desirable experience, and that in many cases the experience and training possibilities outshadowed the lower wage received.

Stores' Need for Cooperative Part-Time Students

When the part-time group is placed where no extra help is needed the purpose of the practice work is defeated. In several instances merchants were willing to employ more than one student, but would not have had sufficient work in dull periods to retain more than one. This practice was discouraged so that consistent employment for any one student would be assured. Students were placed only in those positions that were actually available in the store. No positions were created for them at any time. When the latter is done, students become observers rather than responsible workers.

Trainees as Sources of Supply to Fill New Positions

If the objectives of the training are realized a real service will be rendered to the merchant, definitely measurable in terms of increased job efficiency and job attitude. In this way the merchant will come to look upon the cooperative trainees as his main source of supply for new positions that develop within his organization, for replacements of personnel, and for promotions.

The merchant is readily convinced that cooperative trainees are his best source of supply if he sees real and tangible results accruing from the training as reflected in an efficient and desirable corps of personnel.

In an effective program, the merchant's part is to give organized, supervised opportunities to cooperative high school pupils with the aim of securing trained workers for all new positions not filled by promotion within the store.

In the spring term the merchant or his employment manager should have decided which pupils in the practice group he wishes to engage for permanent work. If careful follow-up work has been done, the choice will be intelligent, based on accurate practice and observation, with some idea of the ability of the part-time student worker to fill the position.

Working Schedule of the Trainees

It is important that the school authorities consider the time, hours, and days or parts of days, and months when these workers are most needed by merchants. By working together in this way, great benefits accrue to all concerned.

It was necessary to arrange a cooperative part-time working schedule that would be in accordance with the state requirements for school attendance and with the federal and state regulations covering minor workers.[4]

It was agreed that cooperative students would be employed a minimum of 15 hours per week. In all cases, therefore, the stores were encouraged to employ the minimum number of cooperative part-time workers that they could use throughout the school term rather than the maximum number they could use at any one peak period of business during the term.

In order to meet the needs of the local merchants, the school schedule for cooperative students was arranged so that the students would be free to report to the job at 1 p.m. daily. Cooperative part-time students, therefore, would attend classes in the school from 9 to 12 a.m. daily, and report to the store in which they were employed, when the volume of business justified their employment.

The student cannot be expected to attend classes regularly, to participate in class activities, and to work a required number of hours or weeks each term in the stores, unless he is assured of permanent part-time employment throughout the school term.

The Advisory Committee

An advisory committee of five persons known as The Millville Advisory Committee for Retail Selling was formed. This Committee included one representative of the Millville school system, one member of the staff of the Millville Retail Merchants' Association, and three representatives of participating stores. At the outset, the store representatives were assigned to serve for one, two, and three years respectively; thereafter to continue to serve for terms of three years. This insures continuity of the Committee and at the same time permits rotation among participating stores. Upon appointment, the committee met and elected a chairman whose duty it was to call and preside at all meetings. The teacher-co-ordinator served as secretary to the committee and was without vote.

The purpose and function of the Advisory Committee was as follows:

1. To recommend policies
2. To give information about the educational needs of distributive workers
3. To suggest the different lines of distributive and service businesses in which instruction may be organized
4. To recommend appropriate courses and instructional materials for use by instructors
5. To cooperate in a constructive program of publicity
6. To determine the wages to be paid
7. To advise on the solutions of problems as they appear in the operation of the course

Summary of Points Covered in Agreements

Certain definite understandings or agreements having been reached relative to the wages to be paid, working hours, and sequence of work, the question arose as to the form in which these understandings should be set forth. In some cities rather elaborate written contractual agreements are drawn up; in others these agreements are only oral understandings. In Millville, it was believed that an oral agreement was all that was necessary. When a cooperative program is carried on with relatively few stores, and under the leadership of a co-ordinator who has an intimate knowledge of the stores, their policies, and administrators, an oral agreement is adequate.

The following statements indicate something of the nature of the points which were covered in the oral agreements between the school and the stores:

1. To keep records of pupils' store attendance
2. To observe pupils for guidance purposes
3. To employ pupils each afternoon and on Saturdays throughout the school year for an average minimum of 15 hours per week
4. To assure the pupil, if work is satisfactory, of full-time position at the close of the training period
5. To pay pupils a certain wage
6. To dismiss no pupils without first consulting the co-ordinator
7. To dismiss pupils who give up their retail selling courses
8. To employ none without the school's consent until they have been graduated
9. To treat students exactly as other store employees
10. To assign students to different minor jobs in order to supply an adequate sequence of store experiences

Summary

Definite standards should be established for the cooperating stores in order that the student may profit to the fullest extent by the time spent in store work.

The co-ordinator was the person primarily responsible for the selection of the cooperating stores.

An oral agreement between the school and the stores covering the necessary points was preferred to written agreements.

Although it is not possible to secure a uniform wage rate, each store agreed to pay cooperative trainees the prevailing rate paid for similar work in that store.

The working schedule of the trainees was arranged to meet the needs of the local stores.

[4]Federal and state regulations for minor workers restrict the age at which the minor may work, the number of hours he may work in any one day — including the time spent in school — the time of day in which he may work, and the wage he may be paid.

Wartime Woodworking Industry and Vocational Training

ISADORE M. FENN*

Few persons realize the importance of the woodworking industry in this war. They have no idea of the task which this great industry has undertaken in order to help our country win the war. Many individuals have been indoctrinated with the idea that this is the Metal Age and that all implements of war are therefore manufactured from steel or other metals. They do not know that wood is one of the vitally important factors in our country's potential reserve strength. With proper conservation and reforestation, we can provide an annual crop of timber sufficient for our needs. Almost one third of our country is tree-growing land.

The most important factor in the use of wood in producing war implements is that it helps to conserve materials that are on the critical list. Furthermore, the woodworking industry, with its many carpenters, cabinetmakers, patternmakers, and other woodworkers doing war-production work, has greatly increased our supply of skilled man power.

This essential industry is equipped to manufacture 450 articles needed directly in the war effort. The facilities of many furniture manufacturers are being used to produce plywood planes, gliders, and other articles. Airplane parts, in which wood is successfully used instead of metal, are rolling from assembly lines. Wings, fuselages, and tail assemblies, into which go hundreds of small wood parts, are under construction at top speed.

The "Woodworking Industry Operation Chart," issued by the War Production Board, New York City, shows such items as the following which are manufactured from wood:

For Aircraft

Plywood cargo airplanes	Aircraft float lights
Airport light bases	Detachable propellers
Trainer plane cells	Solid propellers
Nacelle-nose cones	Stabilizers
Tail cones	Tail assemblies
Fuselage decks	Navigator tables
Elevators	Trainer planes
Fins and rudders	Wing assemblies
Gliders	Shell cushioning packing

For Army

Benches	Tool handles
Bins	Clothes lockers
Truck bodies	Tent pins
Ammunition boxes	Ski poles
Cabinets	Projectile nose protectors
Commissary chests	Bomb racks
Tool chests	Shoe stretchers
Cots	Camp tables
Gun stocks	Prefabricated barracks
Broom handles	
Brush handles	

For Navy

Ammunition barges	Ship launches
Inland waterway barges	Masts and poles
	Mine sweepers
Invasion barges	Ship models
Target bombing boats	Oars
Buoys	Pontoons
Dinghies and dories	Life rafts

Wood is used exclusively in the construction of these articles because it possesses relatively great strength for a given weight, is relatively inexpensive, and can be manufactured into any needed shape with a minimum production cost.

With the woodworking industry's rapid expansion in the production of essential war articles, and the consequent drain on woodworkers, there arises a greater need for these skilled warworkers.

The War Production Training Program, sponsored by the U. S. Office of Education, is giving training for occupations which are important in the war program in technical and vocational schools throughout the country, and is providing the woodworking industry with many of the needed warworkers.

Following are woodworking occupations with job definitions from a list issued by the War Manpower Commission, U. S. Office of Education, for which vocational training for war production workers is offered:

Airplane Woodworker — Constructs, by hand and machine, wooden parts of aircraft, such as fairing, door and window frames, floorboards, and component wooden members of the primary structure.

Bench Assemblyman — A skeleton assembler who puts together smaller parts, such as ribs, spars, stiffeners, and other fittings that can be more advantageously assembled at a bench using relatively smaller jigs and fixtures. Workers may be specifically designated according to proficiency acquired, as bench assmblyman, first class; bench assemblyman, second class.

Boat-Oar Maker — Performs the work necessary to cut and shape oars, using various special planes, drawknives, and other hand tools; uses clamps or vises; shapes blade, loom (shaft from handle to blade) and handle trimming edges and rounding corners according to specified dimensions; smooths and sands surface preparatory to varnishing or painting; usually identifies work with personal markings on the blade.

Boatbuilder, Wood — Constructs and prepares small wooden boats, floats, pontoons, and motorboats, using such boatbuilder's tools as a drill and screw driver, brace, hammer, saws, planes, chisels, and calking tools.

Cabinetmaker — Performs handwork necessary to cut, shape, and assemble prepared parts of aircraft and ship fixtures: studies drawings of article to be made; lays out outline or dimensions of part on paper or stock lumber specified; operates such woodworking machines as band saw, jointer, mortiser, tenoner, molder, grainer, and variety machine to cut and shape parts from stock, or may obtain parts already prepared by other workers; trims component parts of joints to make them fit together snugly, with hand tools, such as plane, chisel, or wood file; bores holes for the insertion of screws or dowels, by hand or machine; daubs glue on joints with brush; fits parts together tightly until glue is dry; drives nails, dowels, or screws through joints to reinforce them; glues and fits subassemblies and other parts together in clamps to form completed unit. May install such hardware as hinges, catches, or drawer pulls. May work on either a production line or on special orders.

Carpenter, Fairing — A ship carpenter, who locates and marks the reference points used in assembling a ship's hull and who checks the installation of parts and members; working from blueprints, directing helpers, and using transit, plumb line, tape, and level, establishes exact centers, center lines, and other references, so that the hull will be smooth and even (fair); uses chalk lines and center punches points; uses instruments and helpers to make certain that parts and members installed are plumb and fair, and true to previously established reference marks.

Patternmaker, Wood — Builds wooden patterns, core boxes, and match plates according to dimensions shown on blueprints, by gluing, nailing, screwing, sawing, planing, sanding, and painting, using hand tools, such as saws, planes, chisels, gouges, and mallets, and shop machines, such as band saw, circular saw, borer, router, lathe, planer, drill press, sander, and shaper; checks results with calipers, rules, shrinkage rules, protractors, squares, straightedges, and other measuring instruments; may make sweeps (templates) for making molds by sweep-molding method.

These occupations normally require training much more extensive than can be given in short unit courses. They are offered because certain phases of related training, job orientation, or instruction in certain units of the occupation can be provided. Courses are offered when need

*Chicago Vocational School, Chicago, Ill.

for training is established; that is, if the conditions of demand and supply warrant establishment of such instruction.

Men and women who were trained in these courses to operate machines efficiently, to use hammers and other hand tools expertly, and to inspect and test materials, are now playing an important part in the job of helping equip our fighters.

It is apparent, therefore, that the woodworking industry is a major war industry, that the Vocational Training for War Production Workers program is cooperating to the fullest extent, and that wood is a very important factor in this global war.

Skin Troubles of Machinists and Machine Tool Operators

DR. WALDEMAR SCHWEISHEIMER*

Oil Pimples

The number of articles in medical journals on skin troubles of machinists and machine tool operators is steadily increasing. New materials are being introduced continually, some of which may injure the skin of all workers who have to work with them. Then, there are other materials which affect only those who are sensitive to them.

The handling of *oil* quite frequently causes skin troubles of men working on machines. Sometime ago an Indiana doctor described a condition in a plant where steel shells with a copper band around the base are manufactured. The shells are machined in oil. Lately the men had been having what they called oil pimples or oil boils. They were working in oil up to their elbows, and washing it off with a solvent when they stopped work. Most of the pimples were more or less superficial, but there had also been a number of deep infections. This doctor was especially interested in the question whether a man with a virulent infection of the skin could contaminate the solution so that others using it might become infected.

In its answer to this question the *Journal of the American Medical Association* said that the condition described *oil pimples* as an oil folliculitis (inflammation of the pores of the skin). It is a common occupational skin disease among workers with oil, such as machinists and machine tool operators. Numerous oils and emulsions are used in these processes, and it is improbable that any one oil is at fault. Oil folliculitis, or, as it is sometimes called, cutting oil dermatitis (skin inflammation), is partly caused by infectious germs. Consequently it would seem probable that the oil could be contaminated and if recirculated without sterilization could cause infection in persons working in it.

On the other hand, this opinion is not shared by a valuable bulletin of the Massachusetts Division of Occupational Hygiene. It says that recent investigations of the subject show that oil pimples are produced because oil in constant touch with the skin blocks the opening of the sweat glands and the sebaceous glands, especially those associated with the hair follicles. This mechanical blocking prevents the free flow of the gland secretions, which consequently accumulate, harden, and eventually cause local irritation. Infection also plays a part, but the germs causing the infection come almost entirely from the workers' own skin, rather than from the oil. Since germs which can cause boils are unable to grow in oil, it is unlikely that they are spread by this means. Most antiseptics added to cutting oils in an effort to prevent infection have proved ineffective. Some antiseptics may corrode the metal with which they come in contact, or they may in themselves irritate the skin after prolonged use. Efforts to sterilize the oil by means of heat have met with little success.

Another source to which cutting-oil dermatitis may be attributed is the presence of small particles of metal in the oil. Coming from the various cutting operations in which the oil is used, these particles readily accumulate on the skin and on cotton waste used by workers to wipe the oil from their arms. Germs present on the skin may enter the scratches caused by this practice and lead to infection.

The bulletin of the Massachusetts Division of Occupational Hygiene gives valuable advice for prevention and care of the skin for workers working with oil. Prevention of oil pimples and similar skin diseases depends mainly on removing the oil from the skin, so that the natural gland openings are not blocked. For washing the oil from the skin, a mixture of equal parts of pure liquid soap and fine hardwood sawdust may be used. Another mixture consists of equal parts of white cornmeal and a solution consisting of sulfonated neat's-foot oil (45 per cent), light liquid petrolatum (45 per cent), and a 25 per cent aqueous solution of gelatin (1 per cent). Plenty of warm water and individual cloth towels should be available.

For care of the skin, the following routine is recommended. Before starting work, wash hands and arms in warm water, dry the skin with an individual cloth towel and apply a lanolin ointment. Before lunch, wash oil and lanolin coating from arms and hands with one of the mixtures described. Before starting work in the afternoon, wash as in the morning and apply lanolin ointment again. At the end of the work day, follow the same cleansing method as before lunch. Protect the thighs from contact with oil and prevent oil from soaking the clothes by wearing an apron made of an impermeable material. Wash work clothes frequently. Report promptly to shop physician or dispensary all cases of skin abrasion, redness, itching, pimples, or other skin irritations.

The question arises: what is a boil? It is a superficial inflammatory tumor in the skin, due to an infection. The inflammation frequently starts from a sebaceous gland or a sweat gland or the shaft of a hair. It is usually due to inoculation with a germ of the staphylococcus group. The diseased spot is deep red, hard, tender to the touch, and suppurating with formation of a central slough (core).

The boil may become very painful. Especially pressure upon the boil or movement of the muscles underneath it causes great pain, even by night. In some days of a week the boil is *ripe*. The pustule ruptures then, and the yellowish-white content is extruded or may be removed mechanically. The general condition of a worker may predispose to this skin inflammation, and uncleanliness or unhygienic working conditions surely have influence on its growth. In all cases of boils and especially in extended general furunculosis (furuncle boil) it is necessary to examine the urine for sugar, as a diabetic condition favors the predisposition to this skin condition.

Sometimes only a few workers with a certain oil are inclined to get boils. For evidence whether a certain machinist or machine tool operator is sensitive to oil generally or to a certain oil, the patch test is used. These tests are more important from day to day. To carry out the test, a piece of cotton or gauze is dipped in a solution of the suspected material (be it oil or what else) and applied to a clear spot on the arm or back. The dressing is protected by a piece of cellophane and held by two strips of adhesive tape. The patch is removed after 48 hours (sooner, if an inflammation results through the test). A positive test is indicated by redness or vesiculation at the site of the test.

Sometimes it is difficult to find out the irritating material. In such cases there is nothing to be done but to carry out a patch test with every single constituent

*New Rochelle, N. Y.

of a suspected material. It takes sometimes considerable patience and time from both worker and doctor to find out the real cause of the skin trouble. As a control test, similar procedures may be carried out on the arm of a normal person who is not especially exposed to the material.

Sensitivity to oil pimples and other skin troubles depends also on the condition of the skin itself and on skin changes associated with aging. A thin and dry skin, with a low fat content, is sometimes a predisposing factor. With patience and proper treatment most of these occupational skin troubles can safely be cured.

CONTRIBUTION OF INDUSTRIAL ARTS TO GENERAL EDUCATION

JAMES E. HOPKINS*

"Industrial Arts is a phase of general education that concerns itself with the material processes and products of manufacture, and with the contribution of those engaged in industry." ("Industrial Arts," U. S. Bulletin No. 34 — 1937.)

When industrial activities were a part of the home experience of every boy and girl, the demands made on the school were for academic education. With the changes in industrial organization, the opportunities for home training of this nature were rapidly decreased and, for some time, educators ignored the changing needs of the individual. Originally the academic work had been provided to supplement the home training and, when it became apparent that the school should provide industrial arts, it was organized not as a part of general education but as a special subject not on a par with the approved academic program. As a matter of fact it was, in some instances, looked upon as a means of occupying the time of the less able who could not profit by the academic training.

Fortunately, the entire concept of education is now changed both as to general education and as to industrial arts. It is now generally agreed that our public schools should adjust their work so as to develop the individual, to the extent of his ability, for a maximum of success in living and for a maximum social adjustment and contribution. Industrial arts is accepted as a vital curriculum area in such an educational program and may be, in some cases, the integrating core for less tangible elements. Naturally such a program concerns itself with the educational growth of the child rather than the development of projects. The projects are merely a means to an end which is the better understanding of the origin, treatment, and social significance of the material things with which we are surrounded. The organization should be consistent with the level of general education at which it is being used and the emphasis should be adjusted to the interests and abilities, both physical and mental, of each group of pupils. Approached with this point of view, industrial arts contributes greatly to a functional education. The student acquires mechanical experience, knowledge of materials and construction, social understanding, and attitudes and habits which prepare him for homemaking, leisure-time activities, membership in the community, and, where trade training is not required, for initial employment.

Opportunities must be provided for experiences with a wide range of tools and materials which are closely related to current industrial activities. When the industrial training was done in the home, it was ordinarily the outgrowth of a family need and presented a real life problem which had to be solved. Today the problems are somewhat more remote from the everyday life of the child and it requires a more careful explanation on the part of the teacher to identify them as life situations with which individuals must deal outside the school. The students must have a chance to explore in a broad field of activities and, through contacts with industry, movies, and explanations by the instructor of consumer and industrial problems, must see the importance to himself of understanding as much as possible about our complex industrial organization and its social implications.

Opportunities are provided for both individual and group work in the shop. The nature of the project, as long as it is consistent with the ability of the student, is of secondary importance, but the method of attack must be consistent with good educational procedure. Whether the project is for the student, some member of his family, or the school, a plan must be made or discovered and perhaps modified before work can be started. This involves problems such as amount of work involved, cost of materials and comparative desirability of different designs, construction methods and materials. Next, before actual work starts, the method of procedure is considered and properly organized. Then the student must stay with the job and see it through. This is a real life situation which provides a splendid opportunity for practical education and should develop good work habits, attitudes, and appreciations. This type of procedure should assist the pupil in his attack on any problem, whether it be in the field of general education or out in industry. The consumer education of such a program should be made available to all senior high school boys and girls and certainly all boys should be provided this insight into our industrial life and should have the advantage or the guidance values (both positive and negative) which are contained therein.

The schools are being challenged as never before by students with wide ranges of interests and intellectual ability. Unfortunately some school systems have, in cases of academic failure, simply increased that pupil's time in the shop. This procedure has not solved the problem of the less able pupil and it has, in some cases, overcrowded the shop facilities and made it impossible for the more able to be taken care of. Poor results on a so-called *intelligence test* does not necessarily mean failure in life. Our social organization has a place for less able people to experience personal success and make a contribution to the community if the public schools provide a curriculum in which they have a reasonable chance of success so that they leave school with some education and with proper attitudes and habits. There are some pupils of ability who succeed much better when dealing with practical problems rather than abstractions. Industrial arts may well provide the core curriculum for these individuals and may stimulate them to greater academic success; but to send the academic failures to the shop is a simple evasion of responsibility. Their problem must be faced by the entire educational staff if it is to be solved. The industrial-arts activities will make a major contribution to this problem. They can be modified so that the pupil will experience success commensurate with the effort he puts forth rather than frustration in spite of those efforts. This brings to the individual emotional satisfactions which make themselves felt throughout his program. To some, the mere opportunity for self-expression and manual activity will release emotional tensions which act as obstructions throughout his program. This assistance can and will be given to those of lower ability, but the values inherent in the industrial-arts program should be available also to the more able. The shops should neither be overcrowded with academic failures nor should college preparatory curriculums be so inflexible that the more able are unable to find time in which to take this work.

The industrial arts are a vital curriculum area in the general educational program and should be treated as such. They are prepared to stand shoulder to shoulder with the other departments of our schools in the attack on and solution of those problems which challenge public education and should make a unique contribution to the solution of many problems which develop from our complex industrial civilization.

*President, New Jersey Vocational and Arts Association, Maplewood, N. J.

Problems and Projects

SIMPLIFIED TUBE TESTER

JAMES W. HOSKINS

Palo Alto, Calif.

We can no longer follow the old practice of placing doubtful tubes in an old receiver for a comparison test. Tubes are now too varied in number and applications. When a modern circuit fails to function, there must be a quick, simple way of testing the most frequent sources of irregularity — the tube. A tube tester fills this need.

The tube described herein is of the emission type. All of the tube elements except the heater and cathode are connected together, and a source of 25 volts AC connected across the diode thus formed. A meter reads the total current that all the forced emission from the cathode can produce.

Though this is the simplest type of tube tester, it is of great practical value as tube performance is closely correlated with cathode emission. The circuit arrangement is very flexible and new tubes are easily accommodated.

Since meters are impossible to get, a multirange meter may be used if it provides an 0–1 Ma. range. If a separate meter is used, the 1000-ohm potentiometer may be mounted where the meter phone jack is located (Fig. 5) and the meter mounted where the potentiometer was located.

The panel is a piece of ⅛ by 6 13/16 by 9¾-in. tempered masonite. It is drilled to suit the parts available. The unit is mounted

Fig. 1. Assembled unit with meter

in a case 10 by 7 by 5 in. This case may be made of any materials available. At the time the tester was constructed, a filament transformer was obtainable from one of the supply houses for a small sum. If a transformer cannot be obtained now, one can be wound by salvaging wire from old transformers. To make winding easier, the primary may be wound for 120v. An old 4-tube receiver transformer may be used for the core. If the primary is not burned it may be used as is. When removing the secondaries, count the number of turns on one of the filament windings of a known voltage. From this data the turns per volt may be obtained. When rewinding the secondary, No. 20 wire is used until the 7.5-volt tap is reached and for the 12.6- and 25-volt taps No. 26 may be used. The transformer used for the original model had a 105-volt winding that was used for the leakage test. See Figure 4. When winding a transformer, this coil may be elim-

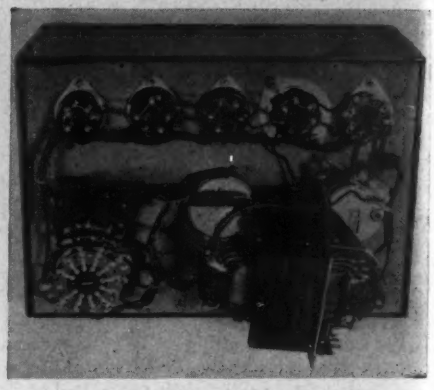


Fig. 3. Underside of unit

inated and the line voltage used in its place. The wiring is very simple since all tube sockets are connected together. See Figures 3 and 4.

In wiring s_1 and s_2, it helps to cable the wires going to the transformer as shown in Figure 3. S_3–S_4 is a DPDT key switch, either a Centralab switch or an old one salvaged from an old radio. Care should be taken in wiring this switch since it is connected to the meter. The ¼-watt neon is shunted by a ¼-megohm resistor to prevent it from glowing when a tube is not actually shorted. The neon only shows shorts between the cathode and heater on all tubes except four-prong tubes. The resistor in series with

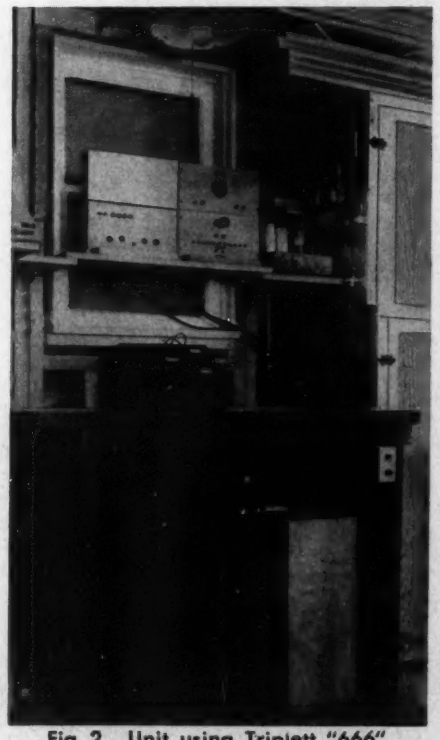


Fig 2. Unit using Triplett "666" multirange meter

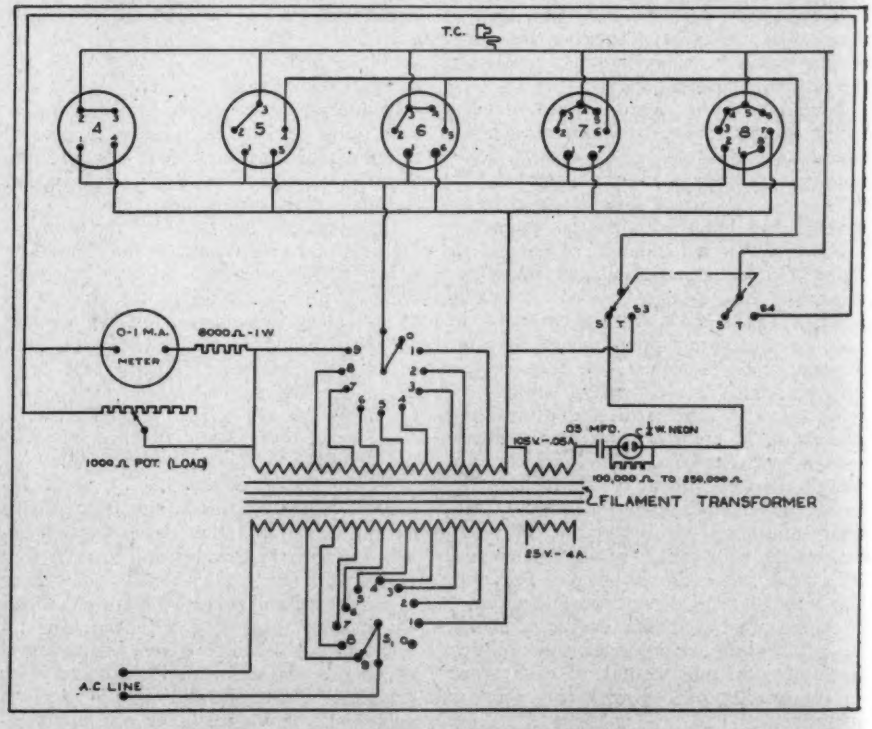


Fig. 4. Diagram from simplified tube tester

the meter has to be calibrated to the meter used. To calibrate this resistor, an 80-type tube of known quality is used and various values are tried until a satisfactory reading is obtained. (.8 Ma. for a new tube.)

Note that operating instructions follow separately so they may be used with the tester.

Parts and Materials Required to Construct the Simplified Tube Tester

1 each type of socket — 4, 5, 6, 7C, 8 octal
1 8000 r 1 w. resistor
1 1000 r pot. (mallory type A1MP)
1 ¼ meg. r ½ w. resistor
1 .05 mfd. cond. 600v.
2 off 1 to 9 selector switches (mallory type 1311L)
1 filament transformer
1 case and panel
Miscellaneous hardware
1 0–1 Ma. meter

Operating Instructions for Simplified Tube Tester

1. Adjust the primary voltage switch (s_1) for proper line voltage. There are nine positions for adjustment of the primary voltage as follows:

1. 127 volts
2. 124 volts
3. 121 volts
4. 118 volts
5. 115 volts
6. 112 volts
7. 109 volts
8. 106 volts
9. 103 volts

2. Set the filament voltage switch for the tube to be tested. See Table I for proper settings of s_2. There are nine positions for adjustment of the filament voltage as follows:

1. 1½ volts
2. 2 volts
3. 2½ volts
4. 3.3 volts
5. 5 volts
6. 6.3 volts
7. 7½ volts
8. 12.6 volts
9. 25 volts

3. Adjust the 1000-ohm potentiometer according to the information given on Table I.

4. Set the double pole double throw switch (s_3–s_4) to the short position (s). Insert the tube to be tested in the proper socket. After it has warmed up — if the neon glows — the tube, unless it belongs to types 5T4, 5U4, 5V4, 5W4, 5Y3, 5Z4, and 6A5, is shorted and should be discarded.

5. Set the double pole double throw switch (s_3–s_4) to the test position (t). If the meter reads that the tube is good, it should read over .5 miliamps. If it reads under point .5 Ma., the tube should be discarded, because its emission is too low to be of any value in practical use.

Table 1.
Chart for Tubes Commonly Used

Tube	Fil. Switch Taps (s_2)	Lead Setting	Tube	Fil. Switch Taps (s_2)	Lead Setting
1A4	2	6.5	25A6	9	2.5
1A6	2	7.	25B6	9	2.5
1B4	2	7.	25A7	9	2.5
1F4	2	6.	25L6	9	2.5
2A3	3	2.5	25Z6	9	1.
2A5	3	3.5	19	2	7.
2A6	3	3.5	26	1	7.
2A7	3	4.	27	3	4.
2B7	3	6.	30	2	7.
5Z3	5	5.	31	2	7.5
6A6	6	2.	32	2	7.5
6A7	6	4.	33	2	6.
6A8	6	4.	34	2	7.5
6B5	6	6.5	35	3	5.5
6B7	6	6.	36	6	3.5
6C5	6	4.	37	6	5.
6C6	6	3.5	38	6	6.
6D6	6	4.	41	6	3.5
6E5	6	2.5	42	6	3.5
6F6	6	3.5	43	9	2.5
6F7	6	6.	45	3	4.
6H6	6	2.5	46	3	5.5
6J7	6	3.5	47	3	5.5
6K7	6	3.5	49	2	6.5
6L6	6	2.5	55	3	6.5
6L7	6	2.5	56	3	4.
6N7	6	2.	57	3	3.5
6Q7	6	3.	58	3	4.
6R7	6	3.	77	6	3.5
6V6	6	3.	78	6	4.
12A7	8	1.5	80	5	3.5
24A	3	5.5	83	5	5.5

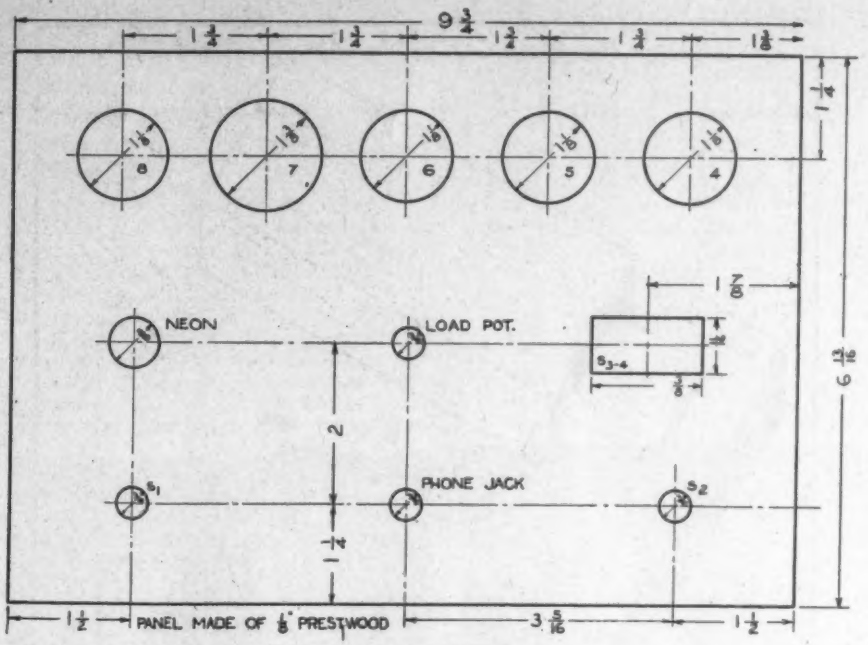


Fig. 5. Tube tester panel

CLEANING THE CIRCULAR SAW HELPS TO KEEP IT SHARP

DONALD MALEY

State Teachers College
California, Pa.

When taking a glance at the circular saw blade, one would think that such a tool could not become dirty after cutting its way through wood all day. But if you look closer you will find the sides of the teeth coated with a brown and black substance. This is caused by oils and resin from the wood sticking onto the blade. This increases the friction and makes the saw much hotter, tending to burn out the blade and make it lose its temper. It also burns the wood as it goes through.

To remove this material, take the blade out and soak the teeth with turpentine. The action of the turpentine will loosen up the oil and resin. Then with a knife or scraper, clean all surfaces thoroughly. For a very thorough job, sandpaper of very fine quality may be used, but be careful not to sand the edges of the teeth.

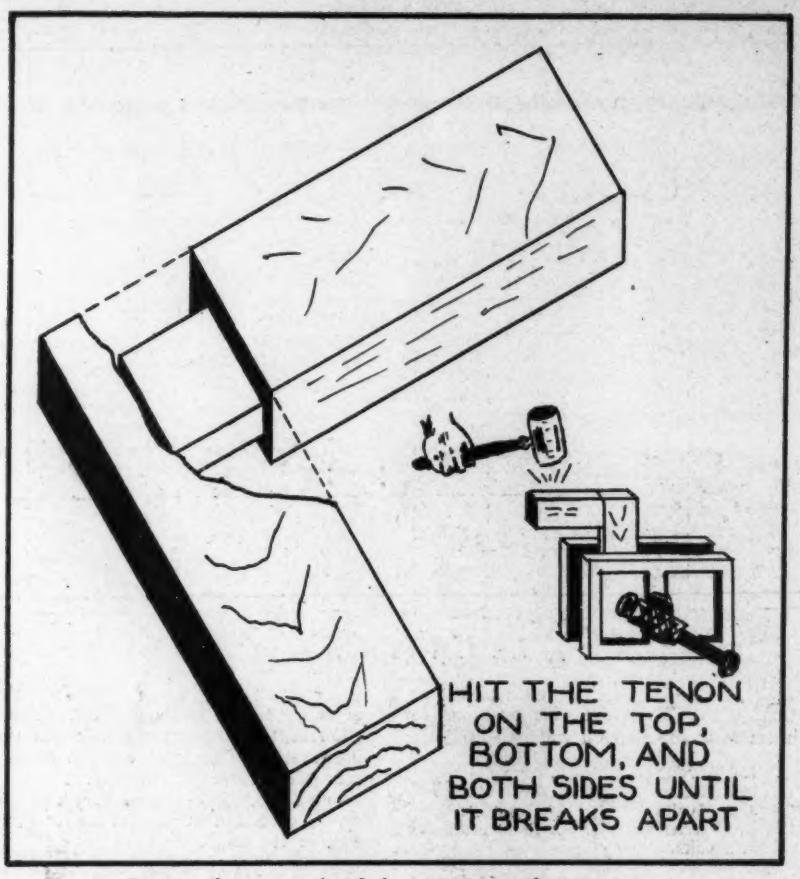
GOOD MORTISE-AND-TENON JOINTS

DONALD MALEY

State Teachers College
California, Pa.

Students and teachers of woodworking are often misled by the outward appearance of their mortise-and-tenon joints. The external surfaces may be perfectly square with a very close fit, yet this does not tell the story of what lies inside the mortise. The old way of testing the joint before gluing was to try and rock the tenon in the mortise. Even this would not give the true relationship of the two pieces of wood.

The sure way to get the internal picture of the service which a mortise-and-tenon joint is to render, glue up such a joint, being careful that the gluing is well done. Then let the joint set in the clamp until the joint and the glue is thoroughly set. When you are satisfied that the glue is perfectly dry, take the clamp off and put the mortised piece in a vise so that it stands vertically and the tenon piece horizontal to the mortise. Then with a mallet hit the tenon back and forth and up and down until the joint breaks apart. When the joint is broken, you will find that where the joint was the tightest and fitted the best the fibers of the wood will have been torn away with one of the pieces. The places where the joint was not tight will show just the dried glue on the wood with no torn fibers. This exhibit will then be a teaching aid that gives an X-ray



Testing the strength of the mortise-and-tenon joint

of this useful joint, and which will point out to the student how accurately he will have to work if he wants strong mortise-and-tenon joints.

COLOR IN THE FINISHING ROOM

DEAN F. SMITH

George Washington High School
Indianapolis, Ind.

The system of handling the finishing room described herein was worked out over a period of years at George Washington High School, Indianapolis, Ind.

The finishing room is 12 by 12 ft., and serves two shop rooms with a combined enrollment of from 120 to 180 students. Most of the wall space is used up with metal-covered shelves which hold containers, or are used as drying racks. There is a small paint cabinet in the room and one turntable. See Figure 1. The stock of finishing materials is kept locked in the small paint cabinet. At present the following materials are kept ready for use: walnut stain, mahogany stain, walnut paste filler, natural paste filler, orange shellac, white shellac, and varnish. Other materials are sometimes used on special projects. The thinners kept in stock are: benzine for stains, alcohol for shellac, and benzine for the fillers. Linseed oil and turpentine also are kept in stock.

The container for each finishing material is composed of three parts: a base, a lid, and a can, as shown in Figure 2. The base and lid fit together to form a water seal. The material is kept in an ordinary tin can so that it can be replaced often to insure clean containers and fresh clean materials. The base of the container is fastened to shelf, making it necessary for the tin can to be lifted out and carried over to where it is to be used. Thinning materials are kept in standard safety cans.

The brush containers are made by cutting an ordinary one-gallon container in two, as shown in Figure 3. The top does not form a seal but it protects the brushes from dust particles. The brushes are suspended in the following materials: stain brushes in benzine, shellac brushes in alcohol, filler brushes in benzine, and varnish brushes in turpentine. A small amount of linseed oil is mixed with benzine and alcohol to prevent these thinners from evaporating too fast.

Fig. 1. Corner of the finishing room showing the turntable

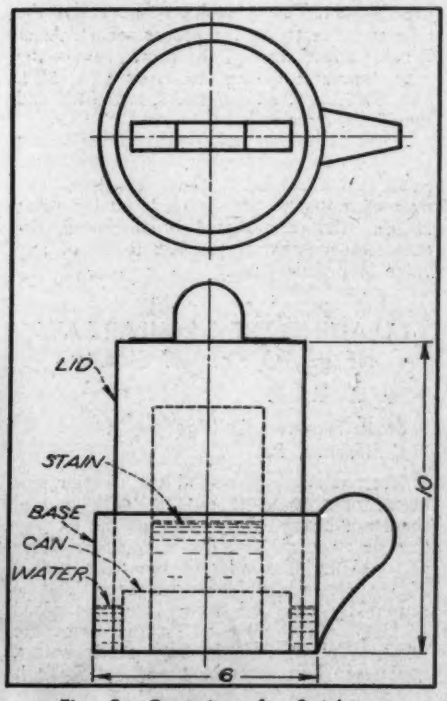


Fig. 2. Container for finishing material

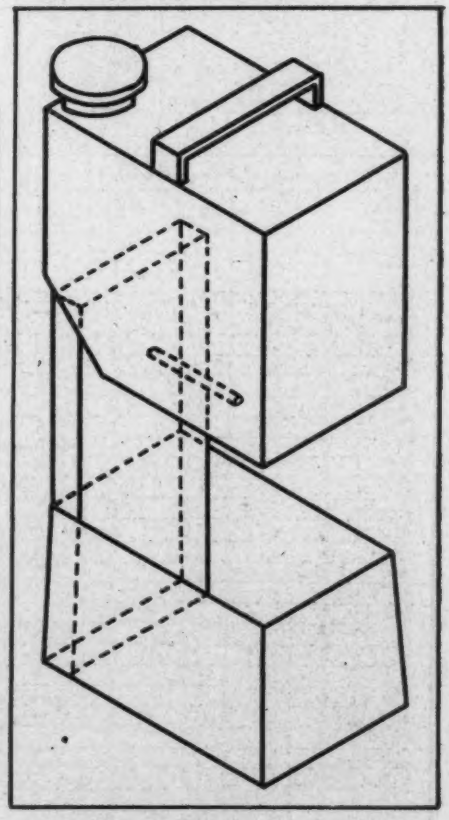


Fig. 3. Brush container

Two methods are used to remind the student where materials may be found and where they should be placed after using. All containers and brushes belonging together are painted the same color; second, they are also labeled. The color which a container is painted depends upon what material it is to hold. Shellac cans, alcohol cans, handles of shellac brushes, and shellac brush containers are all painted orange. Walnut filler cans, linseed oil containers, filler brush handles, and the walnut filler brush containers are painted green. The natural filler can, brushes, etc., are painted blue. The stain containers, benzine containers, and stain brushes are painted red. The varnish containers, brushes, etc., are painted gray. Each can is also labeled as to what it contains. A boy using the walnut stain may readily see the walnut stain can. Also the brush is easily found. If the material needs thinning, he should know that benzine is to be used, but he knows that he must look for a red can. Used materials not properly replaced show up readily. The biggest advantage of this color plan is getting everything back into place. To use the finishing room a student signs his name on a sheet where he also states what material he wishes to use.

One woodshop is located on each side of the finishing room. Two boys from each class (four in all) may use the finishing room at one time. When the class comes in at the beginning of an hour, anyone wishing to use the finishing room must sign his name indicating that request. This list is followed in order, thus eliminating any question of preference.

Most projects are removed to the project storage room as soon as the boy has finished his job. In the case of varnishing, the projects are left in the finishing room until dry.

Instruction in the care of the finishing room is first given by discussion and demonstration. This is followed by showing a color movie made in the shop showing the procedure in using and caring for the material.

The film is on 8mm. color film and is 75 ft. in length. It was filmed in the finishing room in about three hours' time at a cost of five dollars. This film is shown to each class at the beginning of each school term.

EQUIPPING POWER MACHINES WITH MOTOR DRIVES

CLIFFORD EVANS
Vocational Machine Shop
High School
Elkhart, Ind.

Two years ago when the writer came to this school the drive in the machine shop consisted of a line shaft belted to a 7½ h.p. motor. The machinery driven by this line shaft was: 1 Foster No. 3 hand-screw machine, 1 Rockford milling machine, 2 — 15-in. South Bend lathes, 5 — 13-in. South Bend lathes, and 2 — 11-in. South Bend lathes.

To turn this machinery into motor-driven equipment, motor drives were constructed in our welding shop and machine shop, out of materials which were easily obtained. A piece of ¾-in. thick plate was first located and fastened securely to the bed of the machine to be motorized with ½-in. socket-head cap screws. Two gussets were welded to this plate at the proper distance apart so that a piece of 3-in. black pipe of the proper length could be welded vertically between them. A short length of channel iron was welded to the top of this pipe and was closed on the ends by a piece of ¼-in. thick plate which was extended high enough so that it could be tapped for the screws upon which the motor platform was to be pivoted later on.

The motor platform itself was made from 1½-in. angle iron with 1½-in. black pipe welded to the ends for bearings. The bearings were poured around the shafts with hard babbitt. Tension was applied to the belt by a circular cam which was welded to the front

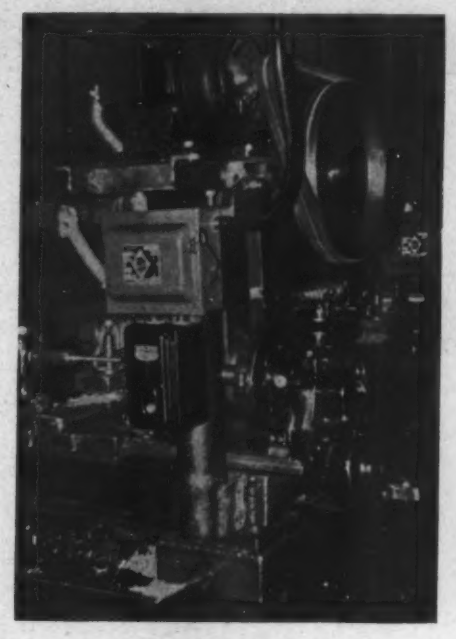


Fig. 3

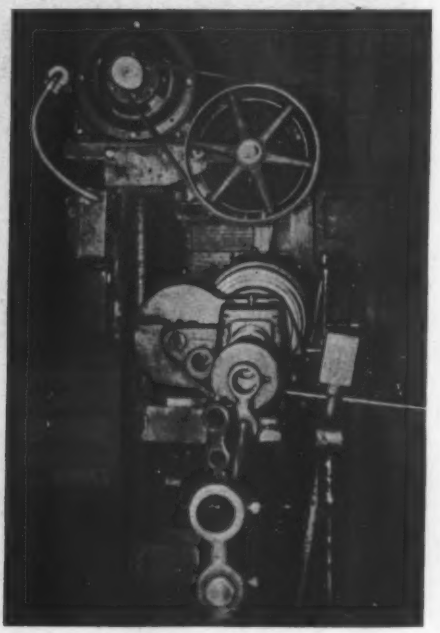


Fig. 6

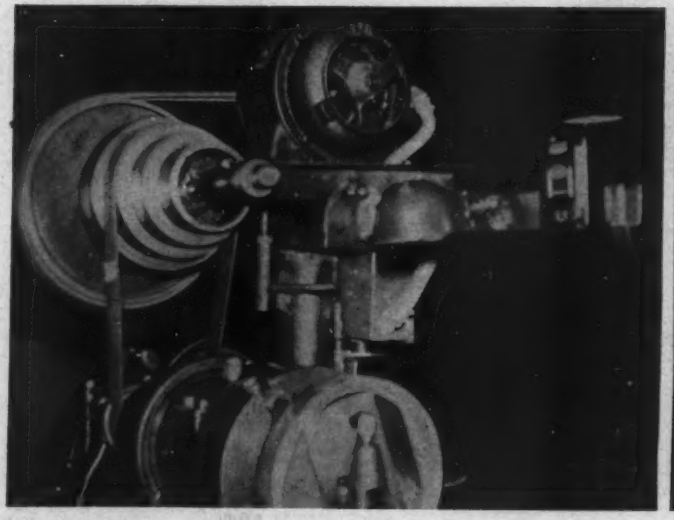


Fig. 1

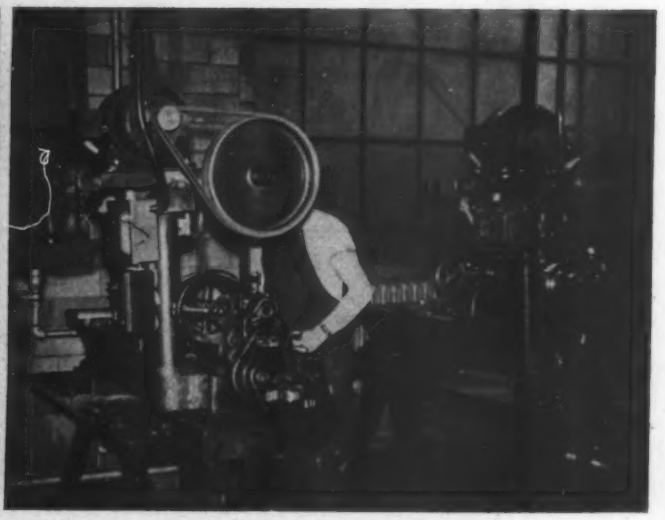


Fig. 2

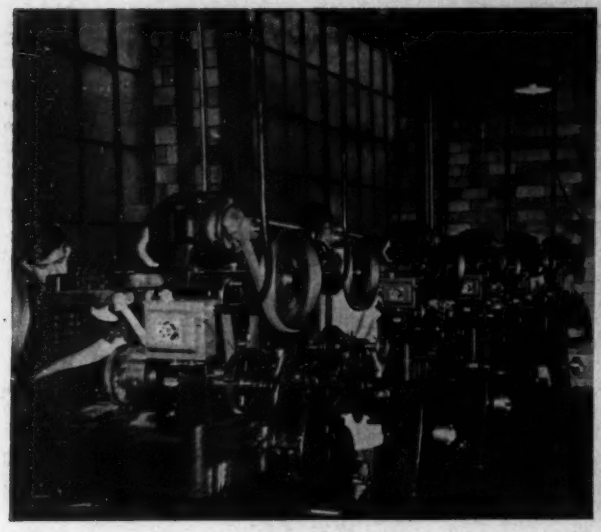


Fig. 4

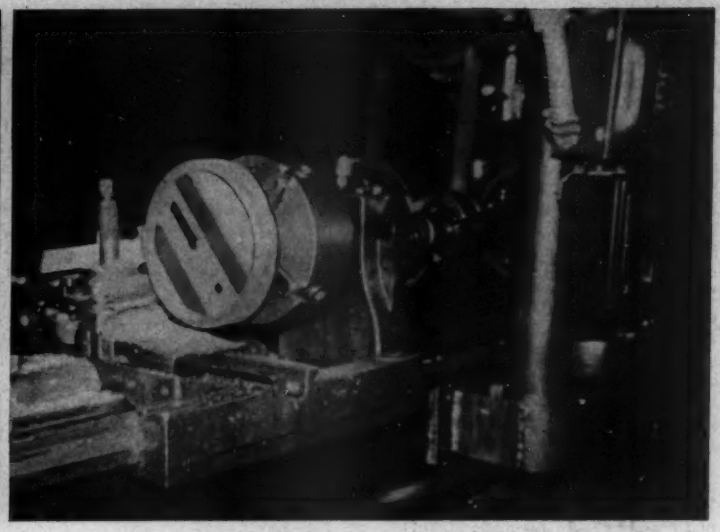


Fig. 5

of the vertical pipe and is clearly shown in Figure 1. The disconnect switch and motor protection box were fastened to welded straps on the back of the pipe.

While these drives were being installed chip pans were being fabricated for these machines. These pans were made of 10-gauge sheet metal. They were first bent and welded, after which holes were cut with a torch so that they might be welded to inverted boxes which were bolted between the lathe bed and the legs.

Figures 1, 2, 3, and 5 give general views of the motor drives. Figure 4 shows a view of a row of these drives. Figure 6 shows the drive applied to the screw machine.

Figures 2, 3, and 4 also show the chip pans.

The actual work of equipping all of these machines with motor drives was completed in about two months by the students in our war-production welding classes, and the day students in the vocational machine shop.

PROGRESS CHART

DONALD MALEY

State Teachers College
California, Pa.

In grading a student, one of the prime features to consider is: has the pupil made any progress or advancement? This question cannot be answered simply because a student has submitted a number of excellent projects. It may happen that although he has done a good job in each instance, he may have merely repeated operations that he had gone over a dozen or more times. In order for a student to progress he must become skilled in an increasing number of operations.

To aid in recording the progress of students, the progress chart shown herewith was drawn up. While the one shown pertains to woodworking, the same method may be applied to other subjects as well. The heading contains a number of pertinent facts referring to the student. On the left side is a column of operations, and space is provided for additional operations so that the superior student may be considered. To the right of these items is a number of project columns in which the grade for each operation on the project may be indicated.

WOODWORKING PROGRESS CHART

Pupil's Name_____ Address_____ Tel. No._____

Age_____ Grade_____ Final Rating_____ Date_____

School_____ District_____ State_____

Entered from_____ Date entered_____

Instructor_____ Comments_____

CODE: (4) Excellent (3) Good (2) Fair (1) Poor (0) Failure

OPERATIONS	PROJECTS 1st	2nd	3rd	4th	5th	Average
1. Squaring stock						
2. Rounding edges						
3. Beveling						
4. Chamfering						
5. Boring holes						
6. Sharpening plane irons						
7. Using chisels						
8. Sharpening chisels						
9. Sanding						
10. Use of screws						
11. Gluing stock						
12. Making joints						
a. Mortise and tenon						
b. Butt joint						
c. Half lap						
d. Cross lap						
e. Middle lap						
f. Dado joint						
g. Dovetail joint						
h. Rabbet joint						
13. Finishing						
a. Shellac						
b. Oil						
c. Varnish						
d. Lacquer						
e. Stains						
14. Lathe work						
a. Straight turning						
b. Beading						
c. Fluting						
d. Faceplate turning						
e. French polishing						
15. Jigsaw work						
16. Jointer operations						
17. Band-saw operations						
18. Circular saw operations						
19. Shaper work						
20. Miscellaneous practices						

Grading may be done on a basis such as: (4) excellent; (3) good; (2) fair; (1) poor; (0) failure.

The instructor makes a careful analysis of the job, and the merits of each operation are recorded. Then at the end of the grade period or term, the teacher can easily see the operations the student has performed, and how he has progressed in each. For instance, each new project which involves an operation used in a former project should show an improvement in the grade, or there is no advancement made.

This chart is also a reminder to the student of what is expected of him, and what he has done. It is a good policy to keep this chart where the student may examine it, and make his own evaluation.

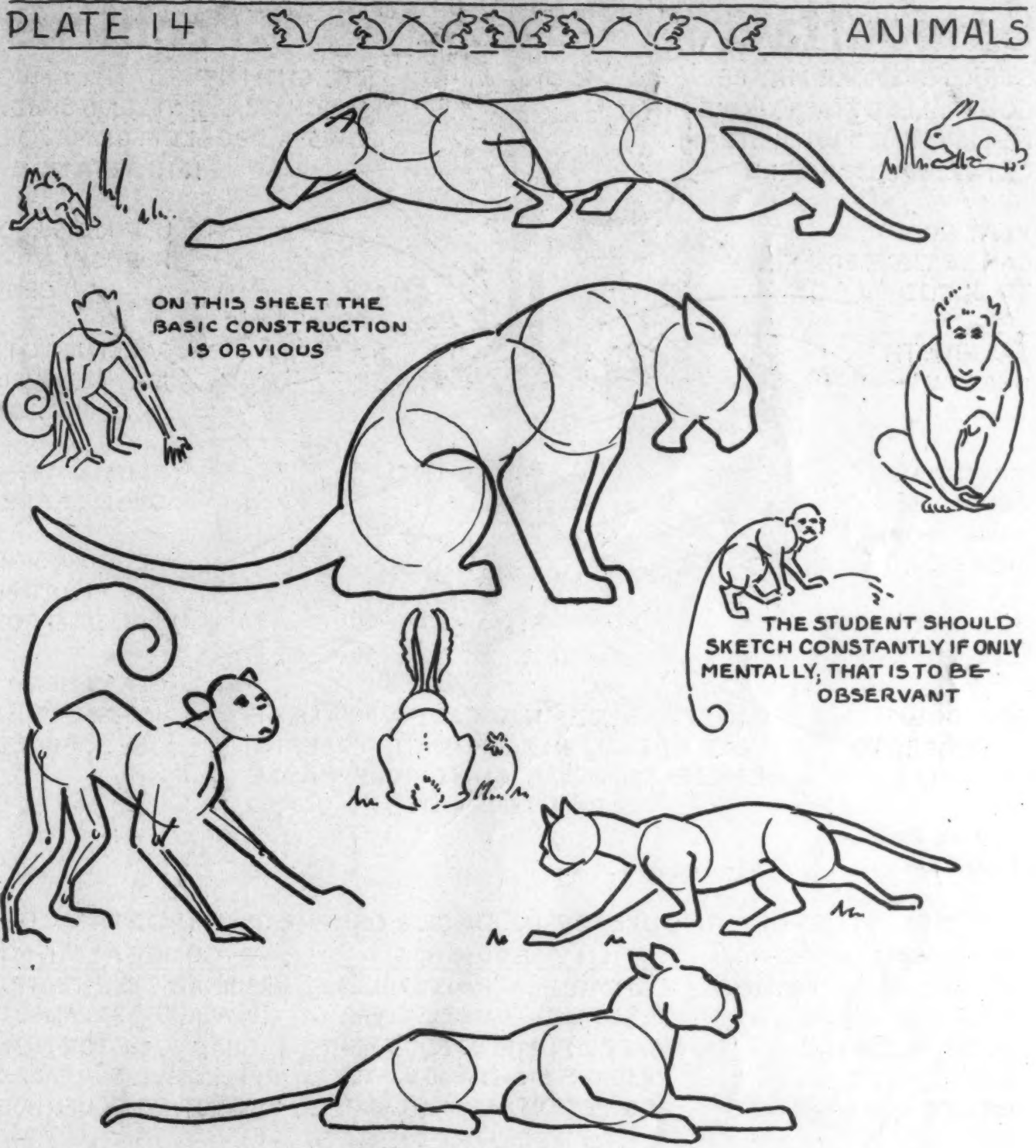
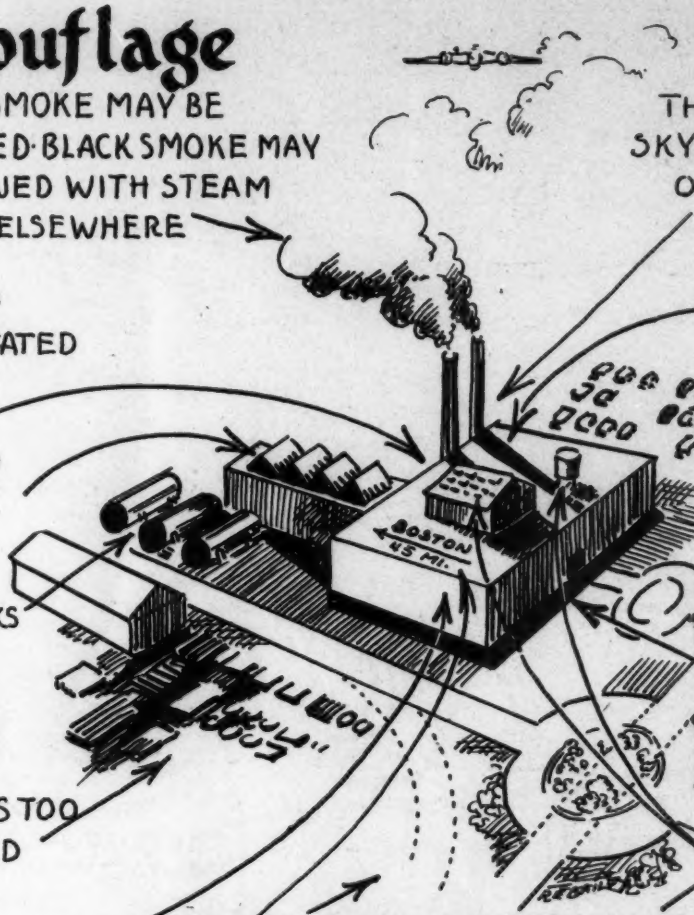


PLATE 14
ANIMALS
ON THIS SHEET THE BASIC CONSTRUCTION IS OBVIOUS
THE STUDENT SHOULD SKETCH CONSTANTLY IF ONLY MENTALLY, THAT IS TO BE OBSERVANT

Plate 14. Creative design course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

Camouflage Problems



STEAM OR SMOKE MAY BE CONTROLLED· BLACK SMOKE MAY BE LIGHTENED WITH STEAM OR FORCED ELSEWHERE

THE CHIMNEYS, TANK, AND SKYLIGHT CAST STRONG SHADOWS· A PROBLEM OF MAJOR IMPORTANCE

FLAT ROOF CAN BE TREATED TO BLEND

USE NETS AND IRREGULAR FORMS

SAW-TOOTH SHADOWS- CONCEAL

PARKING LOT MAY BE MOVED OR COVERED

THESE TANKS SHOULD BE DULLED OR DISPERSED

ELIMINATE— OVAL SHAPE

REGULAR SHADOW SHOULD BE DISTORTED

STOCK PILES TOO CONGESTED

GLASS·METALIC PANE MUST BE SUBDUED

WINDOWS MAY NEED TO BE DULLED

DOTTED LINES INDICATE A MEANS OF DECEPTION TO ELIMINATE TRAFFIC CIRCLE· CROSSROAD AND CIRCLE MAY BE PAINTED OUT·

PLANE DIRECTION OUT

FIFTEEN·STEPS·OF·CAMOUFLAGE·IN·ORDER·OF· THEIR·IMPORTANCE—

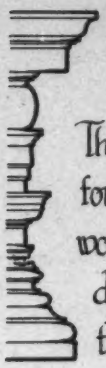
BASIC BOMB PROTECTION	UTILITY SERVICING—	CONCEALMENT
PROTECTION·MACHINERY	COMMUNICATIONS OPENED	LANDMARKS ELIMINATED
FIRE EQUIPMENT	ROADS AND TUNNELS CLEAR	BLACKOUTS ARRANGED
FIRE PROOFING-	WATER PUMPING EQUIPMENT	SHADOW DISTORTION
SHELTERS	RESERVE LIGHT AND WATER	REFLECTIVE SURFACES
WINDOW PROTECTION	PROTECTION·GAS·LIGHT·WATER	PAINTING·COVERING-

FOUR REQUIREMENTS

PROPER LOCATION 40% MATERIAL·COLOR 15% PROPER ERECTION 20%.
CAMOUFLAGE DISCIPLINE 25%.

Plate 9. Camouflage course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

HOW IS TURNED WORK DESIGNED?



The general form of turned work may be derived from the classical column.

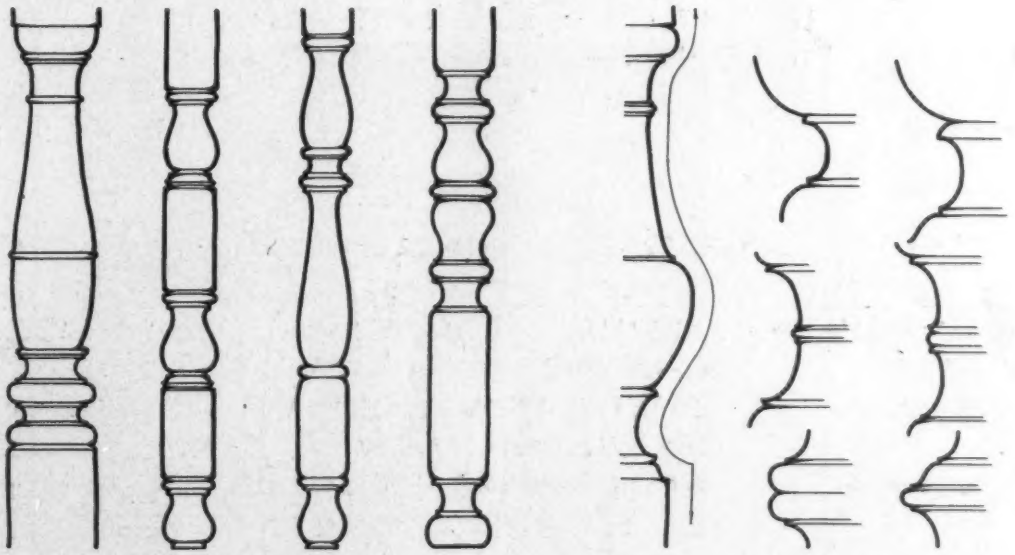
The turned work found in many architectural and furniture styles is highly distinct in character. Correctness comes from careful study of original pieces and measured drawings.

The curve of force is usually employed for contour lines.

Forms generally are simplified to a very few different diameters.

As a rule designs consist of one or two elements (such as the vaseform) repeated in one or another of various combinations with a connecting element between.

The elements are joined by shoulders, or beads to avoid the monotony of long and unbroken curves. Long curves may be interrupted by small rounds or coves in varied combinations.



Element & variation | Element & repeat | Repeat in reduced size | Repeat in reverse | Continuity with breaks | Straight and curved shoulders, coves, & beads

Plate 26. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

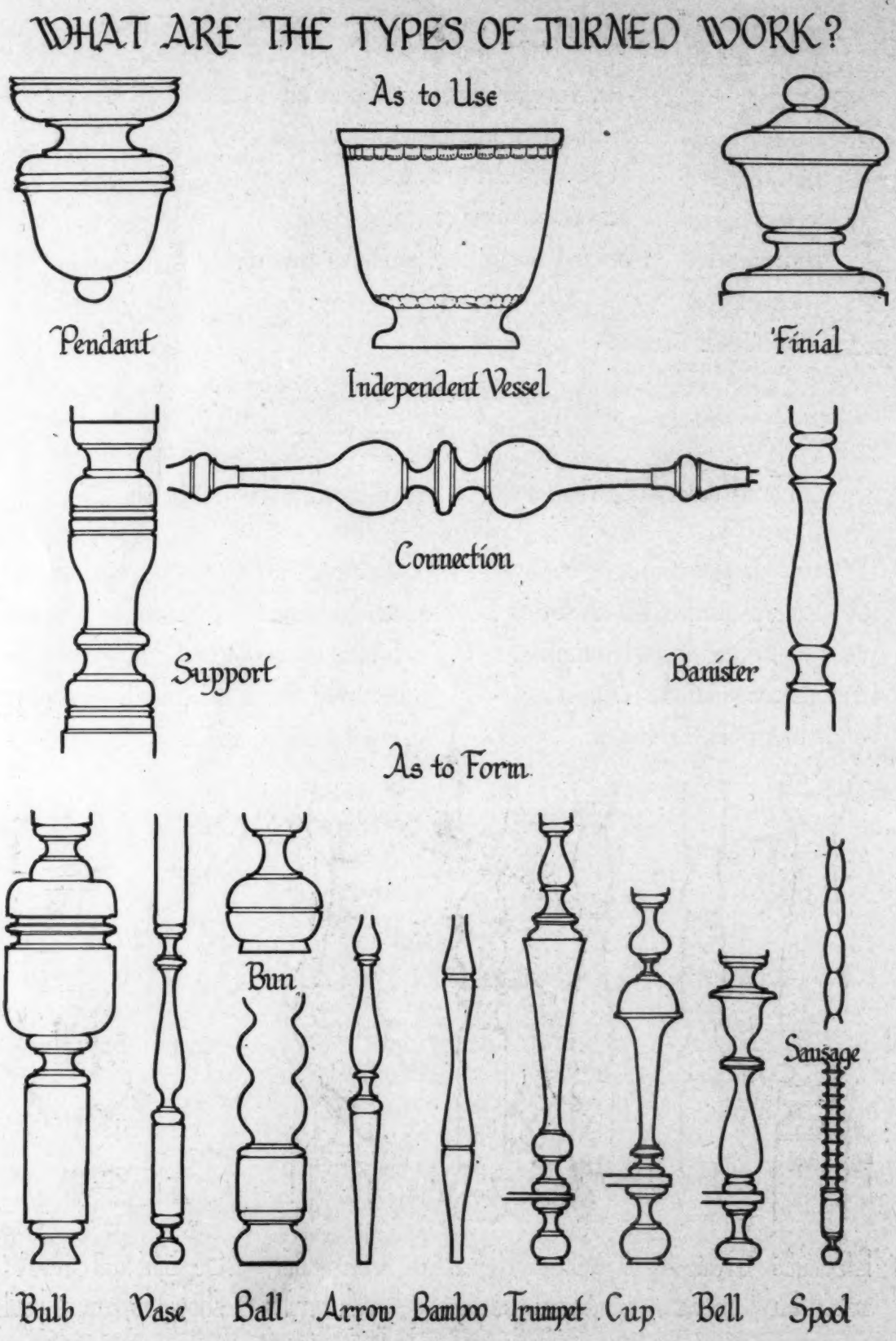
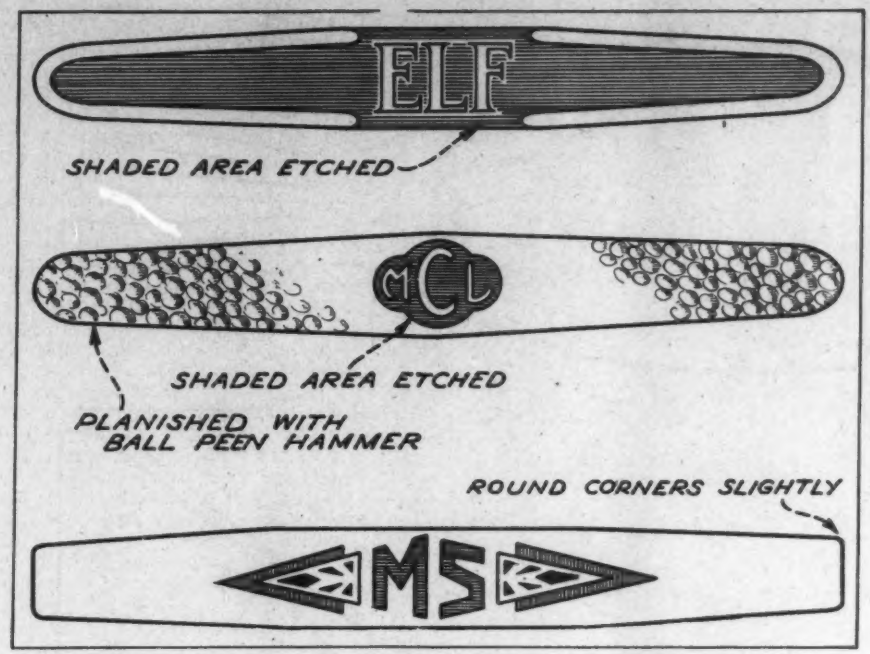


Plate 27. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.



Bracelet designs submitted by Cecil Ford, Prin., Public School, Delmar, Dela.

TECHNIQUES IN USING A JOINTER

JOHN McINNES
Bremerton, Wash.

Parts of Jointer

1. Fence
2. Tilting scale
3. Fence control handle
4. Front table
5. Rear table
6. Rabbeting ledge
7. Gauge
8. Table adjusting handles
9. Depth of cut scale
10. Head
11. Knives

Surfacing

1. Set for 1/16 or ⅛-in. cut.
2. Use push stick.
3. Care should be taken to hold work firmly to table and feed only as fast as jointer will take work without slowing down noticeably.

Edge Jointing

1. Keep stock firmly against fence.
2. Hold work down firmly against the table.
3. In joining long pieces, take care that stock does not tend to go uphill as you start the cut, and downhill on the finish of the cut.

End Joining

1. Use the same techniques as in end planing, that is, joining stock a short distance across the end from one edge. Turn stock so as to start from opposite edge and finish cut.

Rabbeting

1. Remove guard.
2. Adjust fence so that distance from end of knife to fence will be equal to width or depth of rabbet.
3. If rabbet is very deep, make a series of cuts with successive adjustments of depth of cut until desired depth of cut is reached. This technique is very useful in making drawer fronts.

Beveling

1. Set angle of fence for desired bevel and proceed as in edge joining.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT
Hales Corners, Wis.

(*Continued from page 343 of the October, 1943, issue*)

Green Cormorant

The bird shown in Figures 133 and 134 may seem unfamiliar to most people. It is common enough in Canadian waters, and is often found on the same lakes frequented by loons. Of these two fish eaters, the loon is black and white, while the cormorant is highly colored.

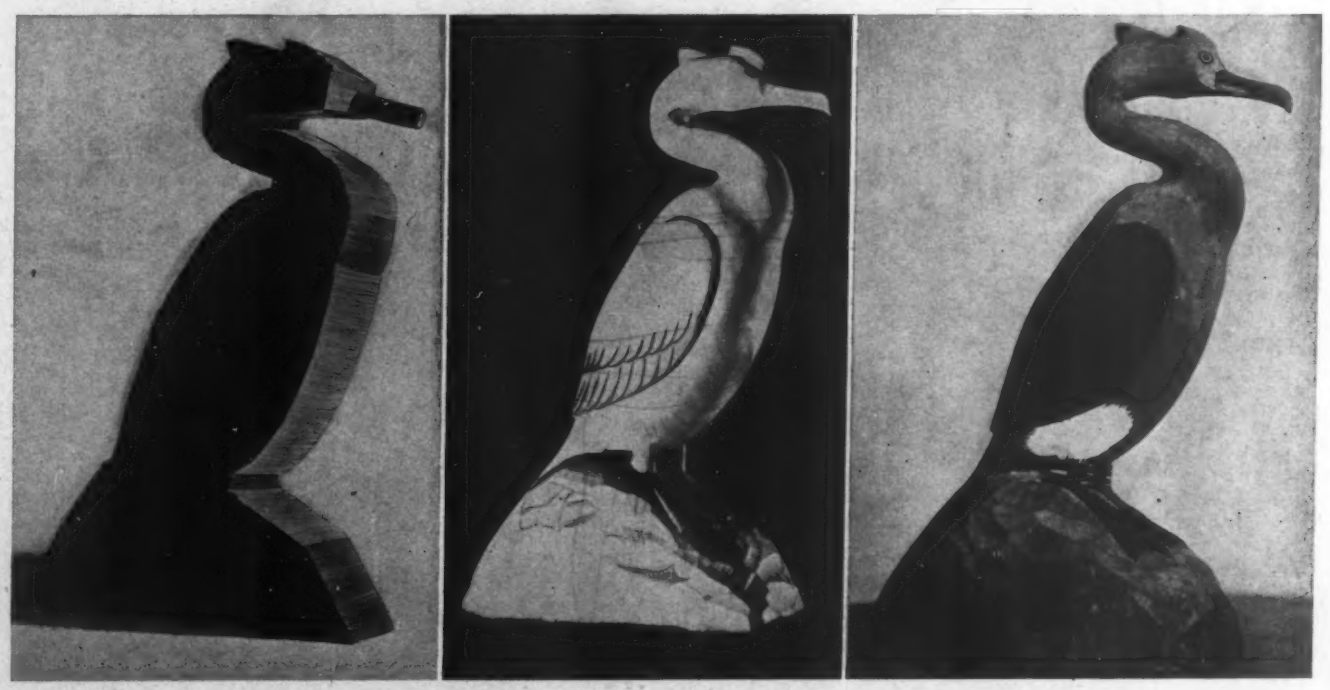


Fig. 133. From silhouette to finished carving

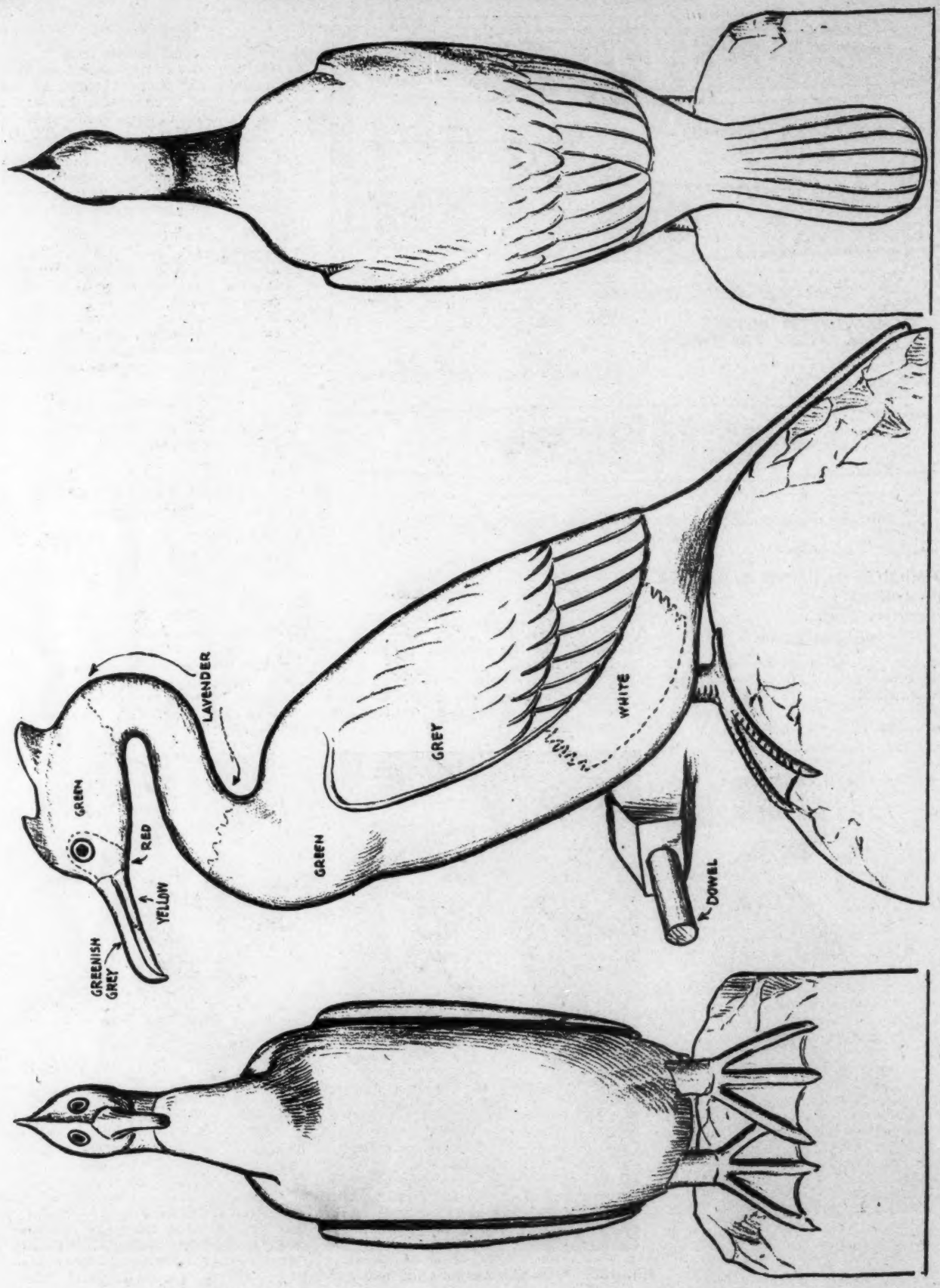


Fig. 134. The green cormorant

When cutting out the silhouette, cut off the beak at the base, as shown in the inset in Figure 134 and in the half tone, Figure 133. Then bore a 5/16-in. hole into the head at the place where the beak should be and glue in a piece of 5/16-in. dowel rod. In this manner all danger of breakage because of the cross grain in the beak will be eliminated.

The painting of this bird is a little complicated. The beak is painted a greenish gray with a small section of chrome yellow on the underside near the base. Then a spot of brilliant vermilion is painted around the eye. The eye is white with a black pupil and with a narrow black outline around the white area. The head, breast, and upper back are a brilliant green. The neck is lavender, blending into the green at the two extremities. The lower body, back, and front are darkened somewhat with gray. The wings are a grayish green, darker than the rest of the back. The spots on the body directly above the legs are pure white. The tail is brown and the legs are dark gray with white or light gray markings as shown in Figure 133. Paint the base to resemble a reddish stone in order to secure contrast.

DRAWING FOR FUN AND PROFIT

A. G. PELIKAN

Director of Art Education
Public Schools
Milwaukee, Wis.

The ability to make adequate graphic representations of objects is an asset which has been widely recognized in the present war-production needs.

Thousands of skilled artists today are making so-called explosion or production illustration drawings to facilitate and hasten the training of new workers on the assembly lines where all kinds of essential war materials are being produced.

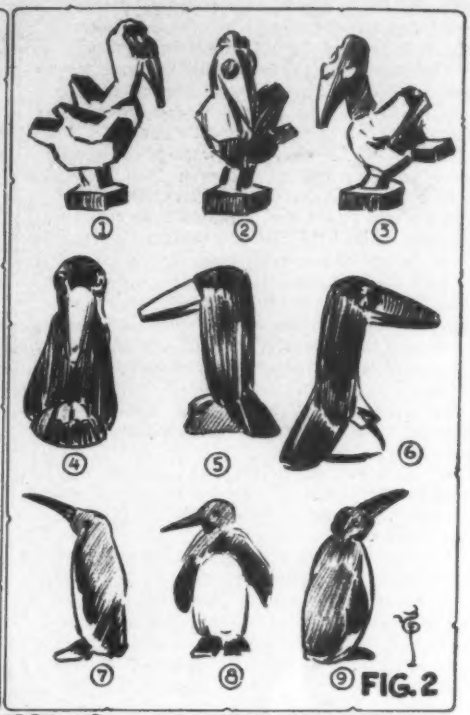
In our public schools, unfortunately, the trend has been to so emphasize training in mechanical drawing and shopwork that the more creative skills or training for other than purely machine-shop purposes is being sadly neglected. This does not apply merely to such subjects as the arts and crafts, but to subjects related to the building and allied industries, as, for instance, woodworking, architecture, patternmaking, printing, plumbing, industrial design, etc.

In all branches of endeavor, whether industrial or professional, some knowledge and ability in freehand sketching is exceedingly useful and may be applied for both profit and pleasure.

Even in the training of the men in our armed forces the use of graphic material has been successfully and extensively employed in every branch of the service.

A simple approach to the art of freehand sketching is illustrated in the accompanying sketches made from inexpensive and amusing ceramic figures of animals and from small toys such as can be found in almost any five-and-ten-cent store.

Figure 1 shows the drawing of a conventionalized duck and a frog, in which all unnecessary details have been omitted and in which the rendering is confined to a simple outline made with a soft pencil or crayon, with shadows merely indicated to give the effect of third dimension. Any one of these little figures could be modeled in clay or carved in soap, or made of plastics or wood.



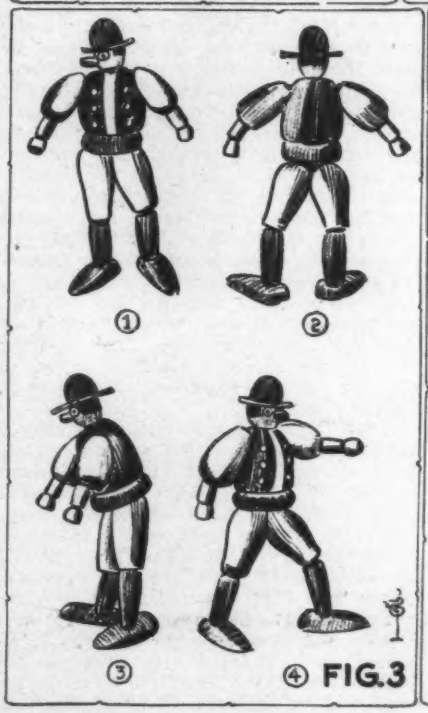


Figure 2 contains similar small figures of stylized birds, but with greater emphasis on the use of light and shade as it strikes planes at various angles and also with more regard to the balancing of dark and light patterns. Not more than three values of black and gray have been used and again a soft pencil or crayon with a flat edge has been used. Any small model may be used and by placing it so that a contrasting pattern of light and dark is produced and the position of the model changed, many unusual and interesting sketches may be made from the same model.

Figure 3 shows that figure drawing is both interesting and difficult. A good approach to the study of figure drawing is by means of small movable dolls which may be placed in various positions and in which the main joints such as elbows, knees, ankles, etc., are mov-

able. Where a figure, consisting of the primary geometric forms, the cylinder, sphere, egg, etc., is used to obtain drawing practice, the knowledge of fundamental form and perspective acquired also is valuable as training for the drawing of purely mechanical parts having similar geometric foundations.

Figure 4. As skill in drawing increases, more detailed figures and even live models may be used. As a further incentive an inexpensive box of water colors or even crayons may be utilized to translate the drawing into color values. When using color it is advisable for the beginner to learn to use color values (i.e., light and dark colors) in the same manner in which the black and white drawings have been made, striving for balance and contrast as well as for accurate proportions in drawing.

The possibilities which this method of drawing from inexpensive small models offers are inexhaustible.

As a leisure time activity the problems may be developed to include groups of figures, and in this way lead to the study of pictorial composition.

For the amateur photographer there is an opportunity to experiment with backgrounds and different light effects. From the practical angle the training and skill which may be acquired is of particular value to all shopmen who should be able to make use of the graphic language to convey ideas or to illustrate in a graphic manner some of the problems which they assign to their students.

AIRPLANE SHEET-METAL SHOP PRACTICE

M. D. CAFFIN

Scotch Plains, N. J.

(Continued from page 275 of the Sept., 1943, issue)

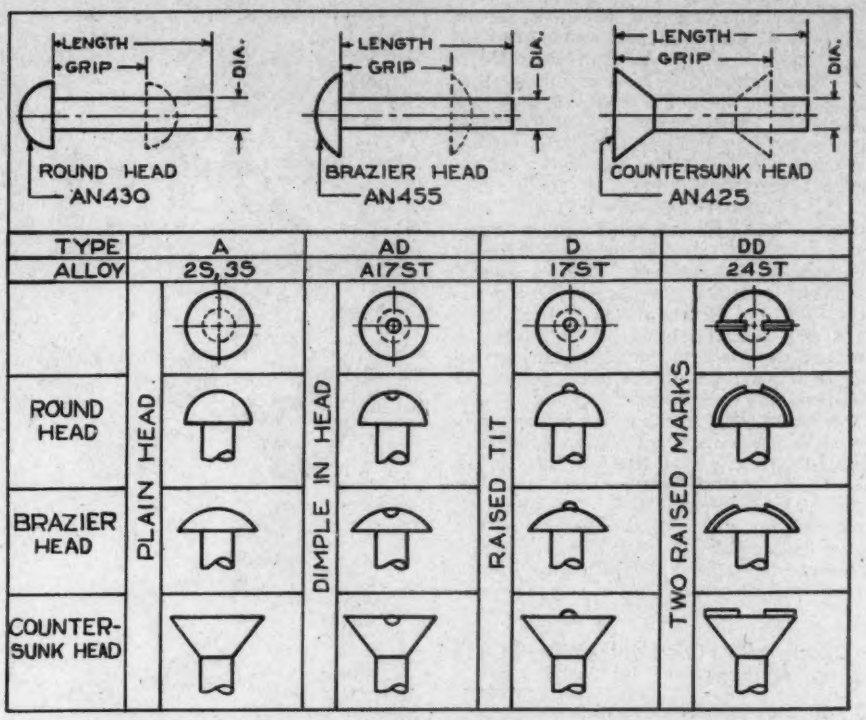
Identification and Classification of Rivets

Standard airplane rivets are made in three basic forms. These shapes are identified by AN numbers as follows:

AN 430 Roundhead rivet
AN 455 Brazier head rivet
AN 425 Countersunk head rivet

Use of Rivets: For structural work the *roundhead, AN 430 rivet* is used widely. Where it is necessary to reduce the amount of rivet head exposed to the air flow, a *brazier type, AN 455 rivet* is used. This rivet is generally like the roundhead but is about 2/3 the thickness around the head and thus reduces the skin friction drag. Modern speed requirements make it necessary to reduce outer skin friction drag to a minimum and the flush type, *countersunk rivet AN 425,* has been developed for this purpose. Countersunk angles used by various manufacturers vary from 78 deg., 100 deg., 115 deg., and 120 deg. Practice indicates that the 100-deg. head is being most widely used.

It is not always possible to use a countersunk rivet. This is true where the sheet metal being used is too thin to permit countersinking without loss of strength. In these cases a *flush type* rivet is used. It is similar to the countersunk rivet, but has a smaller head and is countersunk to an angle of 78 deg. A depression is formed in the metal where the rivet is to be driven. This is called *counterpunching,* or *counterpressing,* or dimpling the sheet. It permits the head to be driven flush with the surface of the skin, yet does not reduce the strength of the rivet joint.



Rivet Head Markings: The *head marking* of a rivet *indicates* the *material used* in the rivet. In general, where a nonheat-treated alloy is used in a structure, it is necessary to use rivets of similar composition. A heat-treated alloy calls for use of a similar type rivet. A chain is no stronger than its weakest link, and an airplane structure similarly must be uniformly strong throughout. A hard rivet used on a structure of softer metal requires excess hammering for proper setting, and may result in stretching or weakening of the surrounding metal.

The shape of the rivet, AN 425, 430, etc., has nothing to do with the alloy used in the rivet. All shapes listed can be obtained in any of the types or alloys illustrated. Thus, an *AN 430* rivet *may be had in type A, type D, DD, or AD.*

Rivet Types: Type A — 2S or 3S alloy is used, not heat-treated; this rivet has a plain head (no marking). (See page 275, Sept. issue.)

Type AD — A17S-T alloy used. This type rivet is very widely used because it is strong, yet needs no heat treatment. It is not as strong as 17S or 24S rivets. The type AD rivet is *identified* by the *dimple or depression* in the head.

Type D — 17S alloy used. This rivet is *most* widely used where strength of rivets is required. It is a heat-treated rivet and the *head marking is a small raised tit* in the center of the head. This rivet is often used even in preference to the 24S rivet, because it can be driven within one hour of heat treatment, but the 24S must be driven within 20 minutes of heat treatment. The aging process of both 17S and 24S rivets is retarded by storing in an icebox. However, even when stored in an icebox at 35 deg. F., they must be headed within 24 hours of heat treatment.

Type DD — 24S alloy is used for this rivet type. It is designated by a raised double dash on the head of the rivet. It must be heat-treated, and is the strongest and hardest of the types listed. It must, however, be used within a very short time of being heat-treated.

Rivet Sizes: All styles and types of rivets are listed according to their diameter and length. *Refer to the rivet drawings for diameter and length designation.* Airplane rivets are available in the following diameters: 1/16, 3/32, 1/8, 5/32, 3/16, 1/4, 5/16, and 3/8 in. Rivet lengths vary by sixteenths from 1/8 to 1/2 in., and in eighths from 1/2 to 3/4 in. Some manufacturers use rivets graduated in 32nds.

Rivet Code Size: The solid type rivets in all types discussed use a code for size designation; for example, 2–3, 3–3, 3–6, etc. The *first number is the diameter,* expressed *in 32nds of an inch.* The *second number* (the number after the dash) *is the length* of the rivet *expressed in sixteenths of an inch.* Therefore, a 2–3 rivet is 2/32 in. in diameter by 3/16 in. long; a 3–3 is 3/32 in. in diameter by 3/16 in. long.

Rivet Specification: Using the information given about rivet shapes, types, and code sizes, rivets are specified as follows: AN 425 AD3–5, AN 430 AD2–3, etc. The *first example is a countersunk* rivet, *type AD* alloy, *3–32 in. in diameter by 5 16 in. long.* The second example is a roundhead rivet, AD type, 1/16 in. in diameter by 3/16 in. long. Where a rivet is specified as follows: AN 425–2–2, it is understood that it is an A type, since the letter A is omitted and a dash is put in its place immediately after the number 425.

Questions

Directions: If a statement is true, encircle the letter T; if false, encircle the F. Fill in correct answers in the completion questions.

T F 1. A brazier head rivet causes less drag than a roundhead rivet.
T F 2. An angle of 100 deg. is commonly used on countersunk rivets.
T F 3. The length of a countersunk rivet is measured from top of head to end of rivet.

T F 4. The length or grip of a brazier or round rivet is measured from the top of the rivet head to the end of the rivet.

5. Each of the following alloys represents a rivet type; identify each:
   24S-T .....
   17S-T .....
   2S or 3S .....
   A17S-T .....

6. Three rivet head shapes used in airplane work are (give AN number and name of each):
   1. .....
   2. .....
   3. .....

7. A rivet with a dimple or depressed mark on the head is a type ..... rivet.

8. Two raised dashes on the rivet head denote a type ..... rivet.

9. A raised dot on the rivet head denotes a type ..... rivet.

10. A plain rivet head denotes a type ..... rivet.

11. Of the four alloys used in rivets as listed in question 5, the following are heated-treated: .... and .....

T F 12. A flush-type rivet is similar to a countersunk rivet, but has a smaller head.

T F 13. Flush-type rivets are used on thin metal where it is not possible to countersink the metal.

T F 14. AN 425, 430, and 455 may be obtained in type A, AD, D, or DD.

T F 15. Type A rivets are as strong as type AD.

T F 16. Type DD rivets age slower than type D rivets (after heat treatment).

17. It is necessary to ..... thin metal to receive flush-type rivets.

18. The material used in a rivet is identified by .....

19. A structure made of 17S-T calls for use of type ..... rivets.

20. Heat-treated rivets may be kept as long as 24 hours before being driven if kept .....

21. Airplane rivets increase in diameter by ..... from 1/16 to 3/8 in.

22. Rivets increase in length by ..... from 1/8 to 1/2 in., and by ..... from 1/2 to 7/8 in.

23. A 3–6 rivet is ..... diameter by ..... long.

24. AN 425 AD 3–5 rivets are ....
(Give rivet shape, type, and size.)

25. AN 430–2–2 rivets are ....
(Give shape, type, and size.)

Answers to Questions

1. T 2. T 3. T 4. F 5. DD, D, A, AD
6. AN 430, AN 455, AN 425 7. Type AD
8. Type DD 9. Type D 10. Type A
11. D and DD
12. T
13. T
14. T
15. F
16. F
17. Counterpress, dimple
18. Rivet head marking
19. 17ST
20. At freezing temperature
21. 32nds
22. Sixteenths; eighths
23. 3/32-in. diameter by 3/8 in.
24. Countersunk, type AD alloy 3/32 in. by 5/16 in.
25. Roundhead, type A alloy, 1/16 in. by 1/8 in.

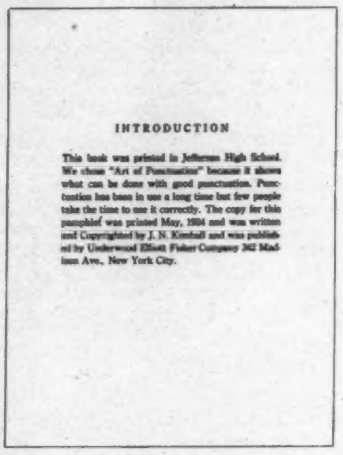
MODERN TYPOGRAPHY

JOHN L. DEAL

Jefferson High School
Rochester, N. Y.

When a new trend in typography appeared above the horizon just a few years ago, few people realized that this trend would establish itself as an important part of type display. What we considered then as a passing fancy has now made a distinct place for itself and even has been dignified by a title which is recognized as modern typography.

At first, there were no recognized rules for the use of the modern layout and very few printers could do much more than experiment. Gradually certain rules or standards were accepted until finally the typographer had some kind of measuring stick to work by. The two rules which might be considered of importance were: first, nonsymmetrical balance; second, an actual or imaginary vertical axis. Of course, there are more accepted rules, but these may be considered of major importance. In previous years the method of display in vogue called for the use of long and short lines centered in the width occupied by the type lines. This, of course, made a symmetrical balance.



INTRODUCTION

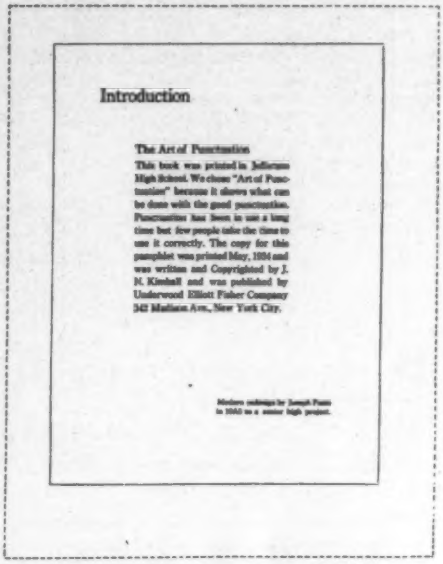
This book was printed in Jefferson High School. We chose "Art of Punctuation" because it shows what can be done with good punctuation. Punctuation has been in use a long time but few people take the time to use it correctly. The copy for this pamphlet was printed May, 1934 and was written and Copyrighted by J. N. Kimball and was published by Underwood Elliott Fisher Company 342 Madison Ave., New York City.

Fig. 1. The original page

Modern typography calls for the moving of the center of balance to the left or to the right and the breaking up of the various portions of the type mass as a whole into irregular groups. This makes a nonsymmetrical balance.

This brings us to the second of the two rules: an actual or imaginary vertical axis which should be to the left or right of the center of the type mass. If this vertical axis is actual, it is usually a vertical line. If imaginary, it may exist in the eye of the beholder as a result of a grouping of various portions of the type mass to secure a common beginning or ending of lines directly under each other, as shown in Figure 2. This, then, is a very sketchy account of two of the factors in modern typography which have generally been accepted as at least six in number. It will be unnecessary in this short article to mention the other four.

Of course, we felt in the Jefferson High School print craft shop that we should at least explore this new phase of typography. So we proceeded to explore. Fortunately we were able to secure a copy of "The New



Introduction

The Art of Punctuation

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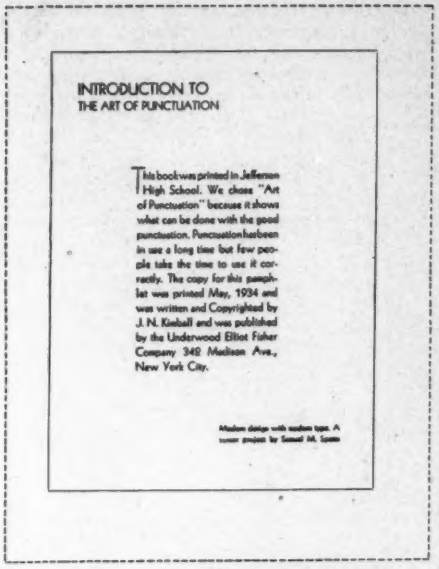
Fig. 2. Redesigned page using original type

Typography and Modern Layout" by Ehrlich and we proceeded to set type according to what was becoming to be accepted as standard practice. But the results of these experiments did not seem to hit the spot and it was not until then it dawned upon us that modern typography needed an appropriate type face. This phase of our development is described in a booklet just off the presses in Jefferson High print craft shop which tells of our experience in printing a booklet in the conventional manner, the redesigning of it in the modern manner, and a second redesign in the modern manner using a modern type face. The booklet was entitled "The Art of Punctuation."

Some time ago *The Inland Printer* had a series of two articles by Douglas C. McMurtie which were very instructive and helped crystallize our more or less vague notions as to what it was all about. With these two articles as a foundation we printed a booklet entitled "Modern Typography" which we hope will serve as a textbook for those senior students who are sufficiently advanced and who desire to examine this new idea in type display. This certainly does not mean that every student in the Jefferson High School print craft shop has "gone modern," but it does mean that those who desire may venture. This booklet is just off the press and will be used in the printing classes.

The third phase was to collect a number of title pages, package labels, letterheads, etc., and compile them in a "before and after" booklet which shows the conventional layout and the modern layout. One of the outstanding exhibits in this booklet shows the three layouts submitted for the cover of a graduation program. This clearly demonstrates that a more lively appearance is secured by the use of contrasting colors up to three in number exclusive of the color of the paper on which the type is printed.



INTRODUCTION TO
THE ART OF PUNCTUATION

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Modern design with modern type. A cover project by Samuel M. Lewis

Fig. 3. Redesigned page using modern type

This booklet has been not only interesting and instructive, but has opened an enjoyable field of exploration which promises more and greater discoveries as time goes on.

A WELDED METAL TOOL BOX

W. W. SCOTT
East Topeka Junior High School
Topeka, Kans.

Teachers of welding are usually on the alert to find projects which will:

1. Give practice in fundamental operations of welding;
2. Give opportunity for instruction in basic information on welding principles;
3. Be of interest to the boy because they are of definite use in his home and work activities;
4. Use available materials;
5. Be low in cost and exceed in value comparable articles on the market;
6. Be within the range of the students' skills.

The tool box described herewith fills all of these requirements.

We urge the boys in our course in general metal work to make tools which they can use at home, or *on the job* when they start to work. A tool box is a welcome addition to the kit of tools.

Procedure:

1. *Design.* The design of this type of box can readily be adapted to meet individual needs. Each pupil is required to sketch a design which he thinks will meet his requirements after he has considered the tools or materials which are to be carried in the box.

2. *Drawing.* After the student has decided upon the over-all size of the box, he makes a working drawing to scale. Here he seeks to obtain a well balanced and well proportioned box. From the working drawing he makes full-size developments of the body, end, and handle.

3. *Bill of Material.* The pupil makes out and letters on his drawing plate a list of material used in making the box. From this list he estimates the cost of the material.

4. *Laying out and cutting material.* When the drawings and bill of material are completed the student goes to the sheetmetal unit where he lays out the parts on a sheet of 22-gauge black iron. The surface of the iron is coated with whiting mixed with alcohol. When dry, the lines are marked with steel square and scriber. The material is cut to size with the tin snips.

5. *Bending and folding.* The edges of the body of the box are folded to the outside in the bar folder. The body of the box is bent to shape on the hatchet and square stakes. A wooden mallet with a smooth face should be used in bending.

The handle is rolled as small as possible in the slip roll forming machine. It is formed into a cylinder around a piece of ⅜ or ½-in. pipe. The edges of the handle seam should touch at one end and be about ¼-in. apart at the other. The bead is started at the closed end and the seam will draw together under the influence of the heat as the bead progresses along the seam.

6. *Welding.* This is an acetylene welding job. After practice in adjusting the flame, and in making a satisfactory corner weld, the student should experience no difficulty in welding the seams on his box. The following procedure has proved helpful.

a) Lightly peen the edges of the metal to be welded. This will help to prevent warping.

b) Fasten the corners together with *C* clamps and a short length of ⅞ or 1-in. angle iron. If a small angle is bent of a piece of copper and placed between the angle iron and the metal it will help to carry away surplus heat. Bring edges of metal together tightly.

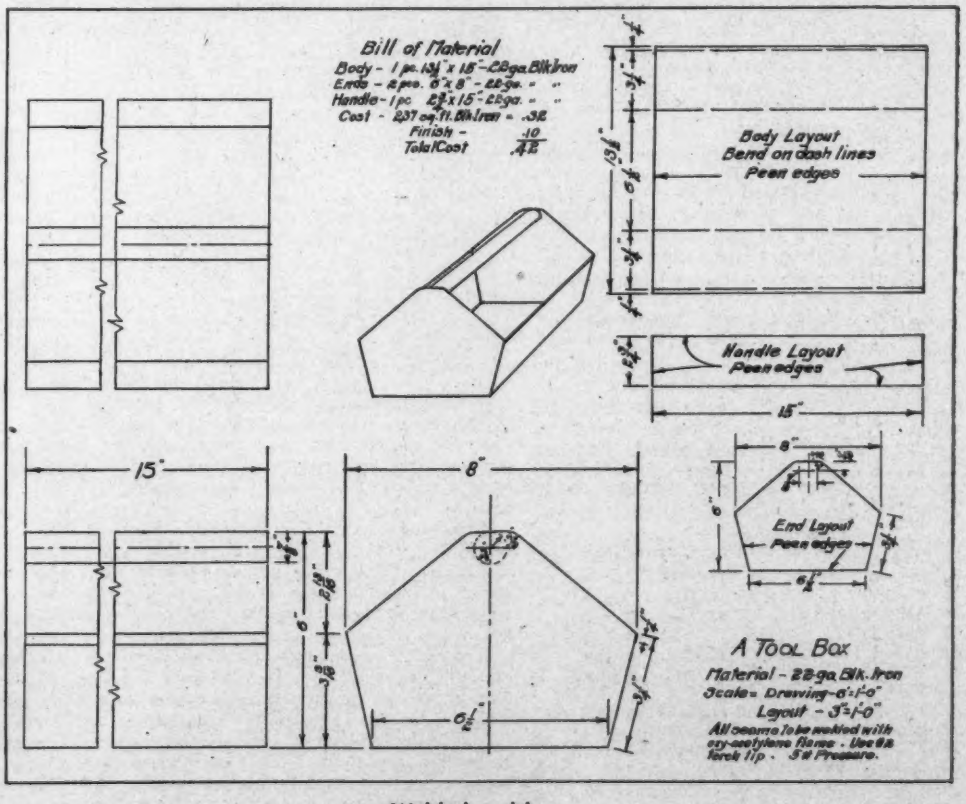
c) A No. 2 tip should be used on the welding torch. A 1/16-in. filler rod is best. If other rod is not available, No. 14 bailing wire makes an excellent substitute. Adjust the torch for a neutral flame.

d) Starting at a corner, *tack* the edges at intervals of about 2 in. Hold the work level. When the seams on one end have been tacked, start at a corner and weld completely around the end. The student should remember that the metal edges and the filler rod must be molten before they fuse together. Regulate the flame to just keep the metal melted.

7. *Cleaning.* Any rough edges should be filed smooth. Steel wool the surfaces.

8. *Finish.* A coat of lacquer, either brushing or spray, gives the box a protective coating and adds to its appearance.

Definite courses mean failures, for some students simply cannot complete them. Schools and classes with no failures are unreal. They build false hopes. They prepare for shocks that are unwarranted and often irreparable. They lower public confidence. — *Homer J. Smith.*


Bill of Material
Body - 1 pc. 13¼" x 15" - 22ga. Blk. Iron
Ends - 2 pcs. 6" x 8" - 22 ga. " "
Handle - 1 pc. 2¾ x 15" - 22 ga. " "
Cost - 237 sq. ft. Blk. Iron = .32
Finish - .10
Total Cost .42
Body Layout
Bend on dash lines
Peen edges
Handle Layout
Peen edges
15"
8"
End Layout
Peen edges
6½"
A Tool Box
Material - 22-ga. Blk. Iron
Scale = Drawing - 6" = 1'-0"
Layout - 3" = 1'-0"
All seams to be welded with oxy-acetylene flame. Use #2 torch tip. 5# Pressure.

Welded tool box

FORGED FIREPLACE TOOLS WITH STAGHORN HANDLES

AUGUSTINE J. BREZINA
Oswego State Teachers College
Oswego, N. Y.

A set of fireplace tools consisting of a poker, shovel, and broom make a practical project for a general metal shop. The set illustrated herewith has staghorn handles topped with brass knobs.

The student will have a variety of experiences in making these tools. Forging is naturally the predominant process, but the project affords opportunities in designing, sketching, drilling, tapping, raising, peening, riveting, polishing, filing, and lacquering. In addition, the use of chemical stains to color the staghorns will provide him with some experimenting in the field of shop chemistry.

Materials used are ⅜-in. cold-rolled stock, No. 18 black iron, 1-in. round brass rod, and about 15 in. of staghorn.

Begin by making some full-sized sketches of the poker hook. Make several drawings and select the best one.

Select about 26 in. of ⅜-in. square stock. Put in the twists by heating the section to be twisted to a red heat. Place the stock in a vise up to the lower mark of the twisted portion shown in Figure 1. Then with a monkey wrench set just above the upper end of the twists, turn to make one or more complete twists. Do not attempt to make a twist after the metal has cooled for the work will only bend and make additional straightening necessary. Continue the twisting process and make sure that all the faces of the stock are parallel and straight.

Should the twist bend toward one side it may be easily straightened by placing it on a piece of wood while red hot and beat it straight with a wood mallet. Do not attempt to straighten the twist on an anvil, for the sides will become dented and marred from the hammer blows.

The twists on the shovel and broom handle are made in a similar manner and it is advisable to put the twists on all of the handles

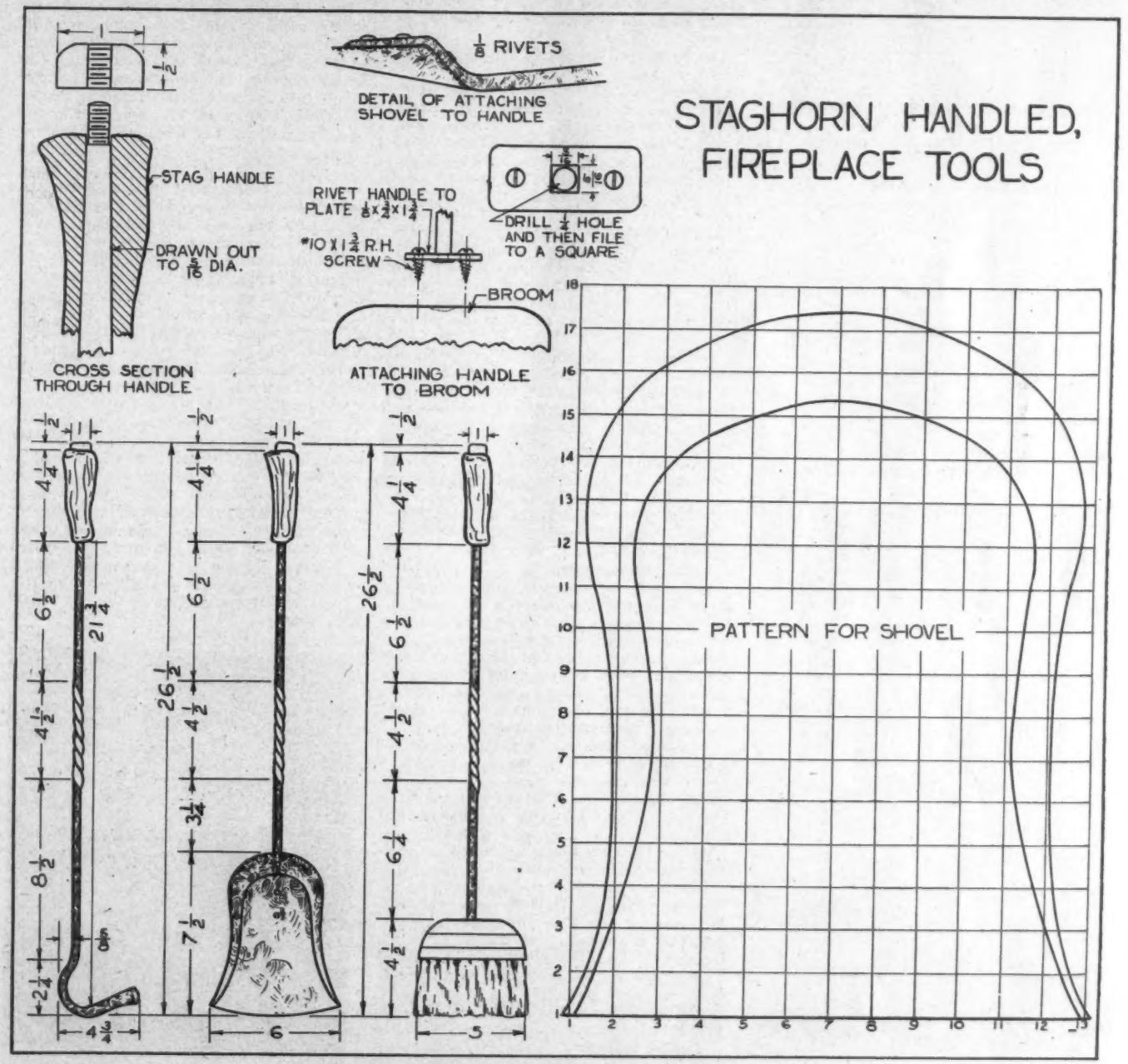

STAGHORN HANDLED, FIREPLACE TOOLS
⅛ RIVETS
DETAIL OF ATTACHING SHOVEL TO HANDLE
STAG HANDLE
DRAWN OUT TO 5/16 DIA.
CROSS SECTION THROUGH HANDLE
RIVET HANDLE TO PLATE ⅛ x ½ x 1¾
#10 X 1¾ R.H. SCREW
DRILL ¼ HOLE AND THEN FILE TO A SQUARE
BROOM
ATTACHING HANDLE TO BROOM
PATTERN FOR SHOVEL

Fig. 1. Details of staghorn handled fireplace tools

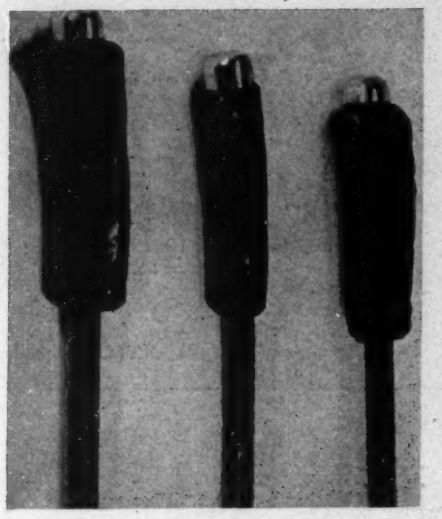


Fig. 2. The staghorn handles

at one time. Keep in mind the fact that all the twists must be of the same length and they should line up with each other when the tools are finished.

In fashioning the poker hook, it is worth while to make a full-sized sketch of the hook and work from this pattern. Refer to it constantly while doing the shaping.

In the actual forging of the hook some of the end stock is first drawn out, and then gradually hooked over the horn and finished to its shape.

The next step is to draw out the handle end to a rough diameter of about 5/16 in. This end will then be filed down to a ¼-in. diameter and threaded as shown. Use a drill gauge as a guide while filing the end down to size. The finished end should slide in and out of the drill hole without too much difficulty. Then thread for about ¾ in.

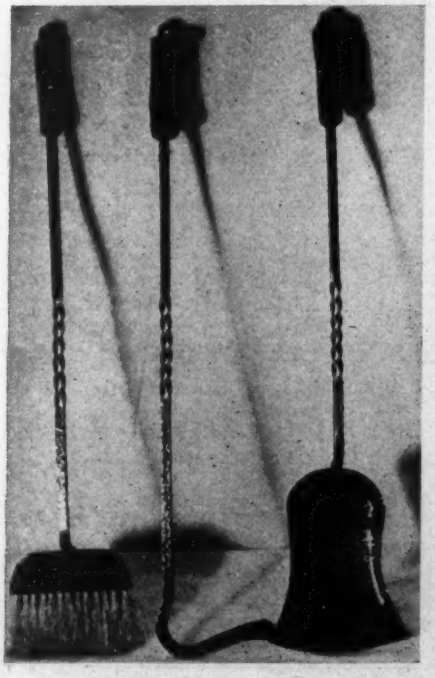


Fig. 3. The fireplace set

In making the shovel, lay out a full-sized pattern and then transfer it to a piece of 18-gauge black iron. The shovel stock may be cut out with tin snips or a cold chisel. Then place the stock in a vise and file the rough edges smooth, and finish with emery cloth. Then lay out an inner pattern which will be the actual bottom of the shovel. The remaining material will be the sides and back of the shovel. Using a ball-peen hammer, beat along the inside line. This is a process of raising and must be done very slowly. As the process advances, work toward the outer edge of the shovel and raise the sides to a rough 45-deg. angle. Then peen the bottom of the shovel. The shaping and peening may be done on an anvil.

The bottom of the shovel handle must be forged so that it will conform to the curvature of the back of the shovel. Failure to do this will result in undue trouble when riveting the shovel to the handle.

In riveting use ⅛-in. rivets. Three rivets were found sufficient to complete the shovel.

The broom may be attached to the handle as shown in Figure 1. A painter's broom, dust broom, or any other may be used for it.

The handles made of staghorn improve the appearance of the tools a great deal. Each handle is 4¼ in. long. The horn is cut with a hack saw and any necessary shaping may be done with a file and some sandpaper. The edges of the top and bottom of the handles are rounded over.

The holes in the handles cannot be drilled because of their curvature. The following method was employed to make the holes. Heat a 3/16-in. diameter rod red hot and gradually begin to burn a passage through the bone. Remember that the rod must also be bent to conform with the bone curve. As you work the rod through, twist it; this speeds up the process. The burning out process naturally will require some ventilation because of the noxious odor formed, but works very effectively.

Next, turn up three brass knobs on the lathe, and finish them with a file and emery cloth. They are then tapped.

The handles will probably be loose and may be set permanently by making a cement, consisting of pulverized bits of brick, mixed with either weld wood glue or thick shellac. Plug the bottom of each bone handle with pieces of wood. Then pack the handle with this cement and screw the knobs on tight.

Finishing: The tools are all peened and high lighted. In peening use a lead cake to preserve the peen marks on all faces of the tools. The tools are then given a burnt oil finish and the peen marks are high lighted with emery cloth. The parts are finally lacquered. The brass knobs are buffed and polished, and the shovel is peened all over.

The bone handles are stained with potassium permanganate. Ordinary wool and cloth dyes may also be tried with pleasing results. The bone handles may, of course, be left in the natural state. If stained, they also should be high lighted and lacquered, or they may be given an oil polish.

The twisted portion of the handle may be polished. To do this clean the twists with a rattail file to loosen all grit and oxides. Follow this up by polishing with emery cloth wrapped around a dowel stick. As the process continues use a finer grade of emery cloth. Finally buff the twists and apply lacquer.

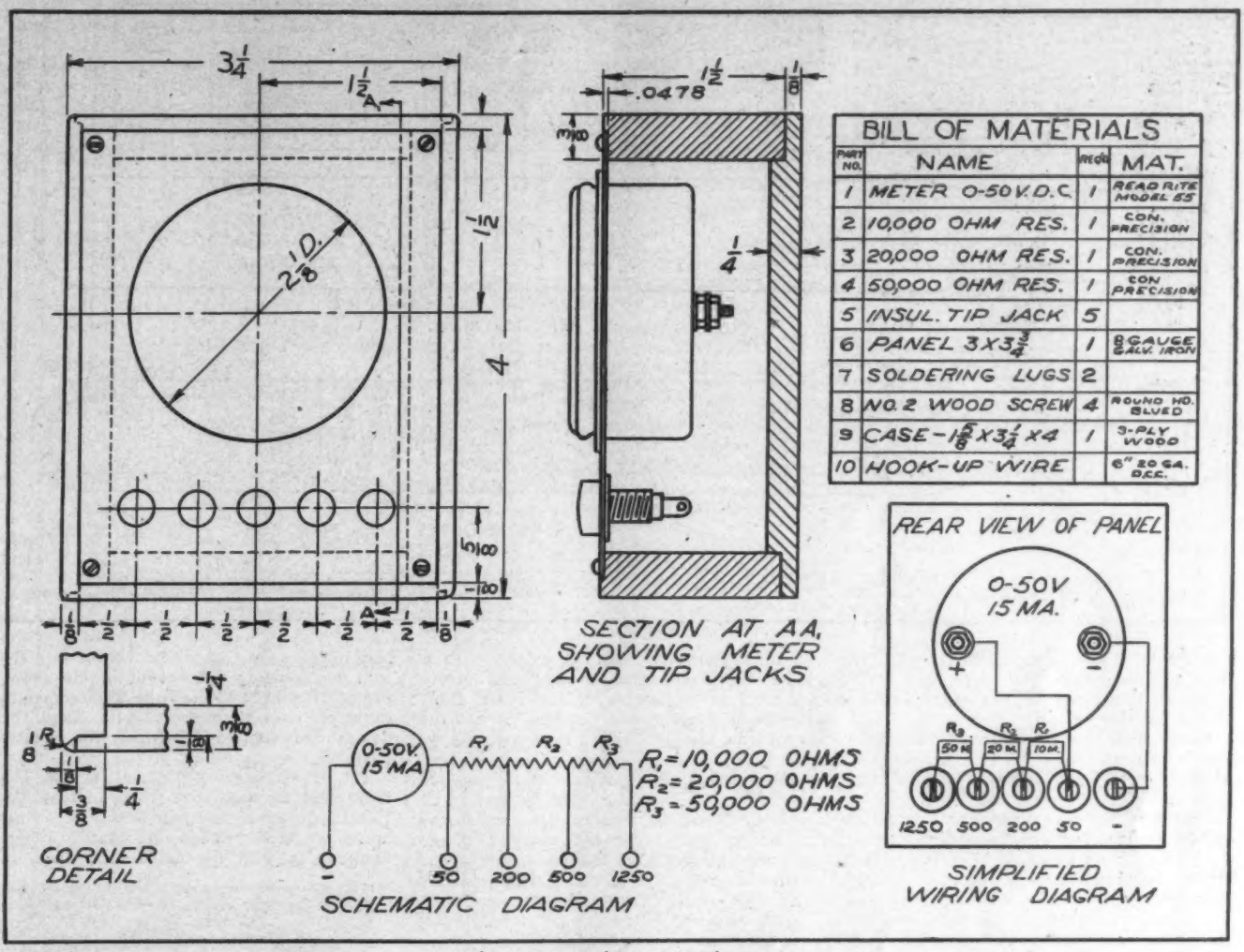
A very unique effect may be obtained by giving the twists a mild treatment of burnt oil finish. By experimenting, the twists will take on very pleasing colors. The shades vary from light blue to a mixture of rust and black. However, it is up to the individual which type of finish he desires.

A LOW-COST POCKET MULTI-RANGE VOLTMETER

PAUL PAYNE
Harwood Hall
Carbondale, Ill.

The radio and electrical experimenter frequently needs a multirange voltmeter. The cost of such an instrument is usually too high for the meager bank roll of the average experimenter, but he can afford to buy a Model No. 55 0-50 volts d.c. Readrite meter for 59 cents, three Continental Precision resistors for 18 cents each, and five insulated tip jacks at 5 cents each. The values of the resistors are determined by a call upon our old friend Ohm's Law from whom we can derive the formula $R + r = E \div I$, where R is the limiting resistor required, r the resistance of the meter, E the voltage we wish to read at full scale deflection of the meter, and I is the current in amperes for full-scale deflection. The Model 55 meter has an internal resistance of 3300 ohms and a current of 15 ma. at full-scale deflection and we wish to read voltages 0-50-200-500-1250 (voltages may be changed to suit the individual builders own particular needs). Therefore, for 200 volts our formula would read $R + 3300 = 200 \div .015$ or 13,333 — 3300, or 10,033 ohms. Since it is impossible to obtain a resistance of this exact size, we would use a 10,000 ohm resistor. The resistance for 500 volts is determined in the same manner as is 30,000 ohms, but we have already placed 10,000 ohms of resistance in series with the meter and we need only to add a 20,000 ohm resistor to give the required 30,000 ohms. For 1250 volts we need 80,000 ohms of resistance or a 50,000 ohm resistor placed in series with the 10,000 and 20,000 ohm resistors.

Multirange voltmeter


BILL OF MATERIALS
PART NO. | NAME | REQ'D | MAT.
1 | METER 0-50 V.D.C. | 1 | READ RITE MODEL 55
2 | 10,000 OHM RES. | 1 | CON. PRECISION
3 | 20,000 OHM RES. | 1 | CON. PRECISION
4 | 50,000 OHM RES. | 1 | CON PRECISION
5 | INSUL. TIP JACK | 5 |
6 | PANEL 3X3 3/4 | 1 | 8 GAUGE GALV. IRON
7 | SOLDERING LUGS | 2 |
8 | NO. 2 WOOD SCREW | 4 | ROUND HD. BLUED
9 | CASE - 1 5/8 X 3 1/4 X 4 | 1 | 3-PLY WOOD
10 | HOOK-UP WIRE | | 6" 20 GA. D.C.C.
SECTION AT A.A. SHOWING METER AND TIP JACKS
CORNER DETAIL
0-50V. 15 MA.
R1 = 10,000 OHMS
R2 = 20,000 OHMS
R3 = 50,000 OHMS
50 200 500 1250
SCHEMATIC DIAGRAM
REAR VIEW OF PANEL
0-50V 15 MA.
50 K 20 K 10 K
1250 500 200 50
SIMPLIFIED WIRING DIAGRAM

A low cost multirange voltmeter

In case you have a different meter, the necessary resistors to use can be determined by using the formula given, and following the foregoing example.

The use of a meter requiring a smaller current for full-scale deflection will give a more sensitive and accurate reading. This will, of course, increase the cost of the meter.

The construction data is given in the working drawing, but the size of the panel and case may be varied if desired. However, the size shown gives a small compact instrument that can be carried in one's pocket. A black crystallizing lacquer or a wrinkle varnish will give the panel a professional appearance; the case should then be stained and shellacked.

The parts may be obtained from a local radio supply house or ordered from any of the numerous mail-order radio supply houses for about $1.50.

The completed meter has a sensitivity of about 60 ohms per volt which is sensitive enough for most voltage readings.

Procedure:

1. Cut panel to size on squaring shears or with tin snips.

2. Locate centers and drill holes for tip jacks and holes and corners.

3. Locate center of opening for meter and cut out with circle cutter. If a circle cutter is not available drill out opening with a series of small holes around the circumference and finish with a round file.

4. Give panel a coat of crystallizing lacquer and set aside to dry.

5. Cut sides from 3/8-in. plywood and square to size.

6. Cut rabbets to take panel by setting variety-saw blade 1/4 in. above the saw table and adjusting rip fence to make a cut the thickness of the panel.

7. Cut corner joint on variety saw by setting blade 1/4 in. above table and make a series of cuts until 1/4 in. of wood has been removed from the endpieces and 1/8 in. from the sides.

8. Glue joints and place in clamps.

9. Cut the bottom to size from 1/4-in. plywood.

10. Set variety-saw blade at 1/8 in. high and cut rabbet around bottom to fit snug into sides.

11. Glue the bottom to the sides and place in clamps.

12. Mount the meter in panel, put tip jacks in place, and hook up the meter as shown in the wiring diagrams.

13. Remove case from clamps. Round corners and sand smooth.

14. Stain case. When dry apply several coats of shellac and rub final coat down with steel wool.

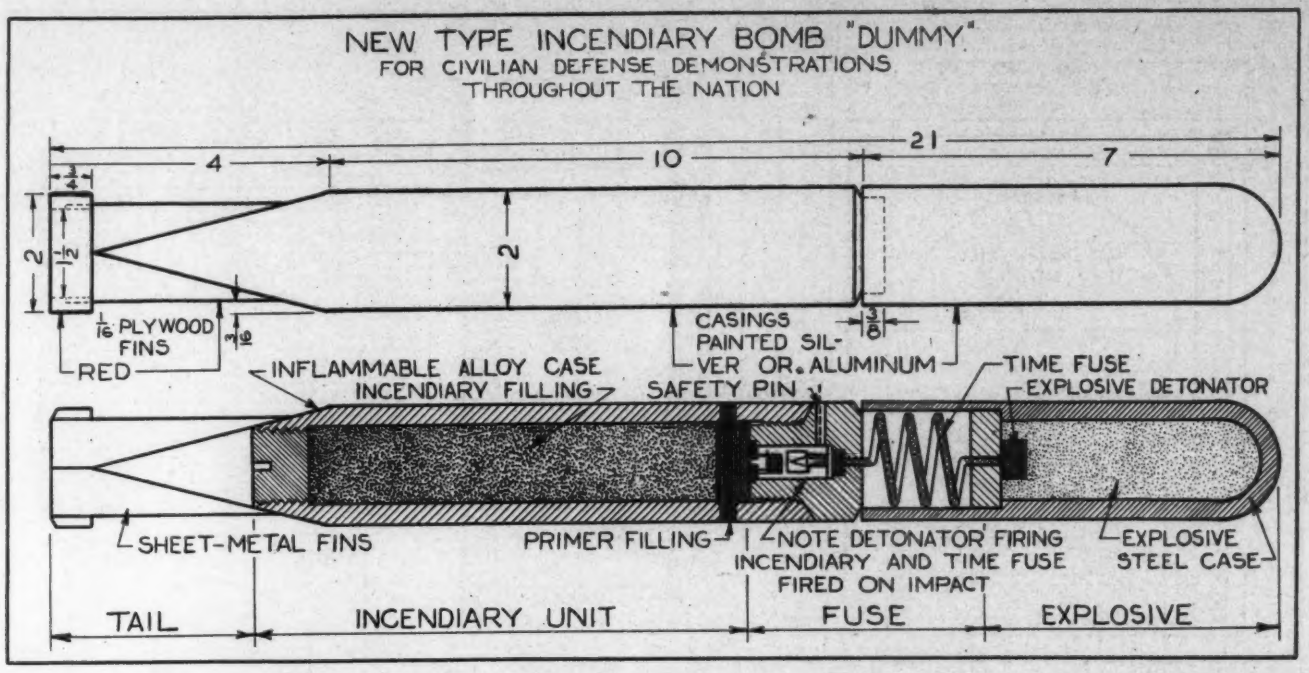
15. Assemble and test.

DUMMY — NEW TYPE EXPLOSIVE INCENDIARY BOMB

ISADORE M. FENN
Chicago Vocational School
Chicago, Ill.

Here is an opportunity for instructors to give their students lathe practice and at the same time acquaint them with this new type bomb — a timely and excellent lathe project.

Students are eager to make this bomb not only for the purpose of obtaining more lathe experience, but also to turn them over to their local civilian defense authorities for their bomb demonstrations. The dummy bomb helps greatly during these demonstrations in making the section-drawing furnished by the Office of Civilian Defense, clear to the people and giving them instruction in handling this terrible destructive weapon now being used by the Axis.



Students find it very easy to construct the dummy bomb from the directions in the drawings. White pine or any other softwood is fine for this project.

Information recently released by the Washington OCD describes this type of incendiary bomb as an explosive incendiary that is larger than the usual 2-pound fire bomb, with an extension of the nose containing a larger explosive charge. The total weight is increased to 5 pounds; its length is 17 inches without its tail, or about 21 inches over all. About 6 inches longer than the old bomb, the additional length is mostly in the nose, as shown. The incendiary section of the bomb ignites upon landing.

MAPLE NIGHT TABLE

NEIL FLANAGAN
East Side High School
Newark, N. J.

The maple night table shown in the accompanying illustrations is an excellent project for an advanced eighth grade or a regular ninth-grade student. The table illustrated was worked out entirely by hand, and will consume approximately sixty to seventy hours. If machinery and power are available the time can be materially cut down.

Some of the salient features in the design are: the flaring legs; use of stop and regular chamfers; a small shelf for reading material; and a drawer for utility use.

In making a table of this type it is best to get out the stock for the legs first. The legs are 1⅜ in. square by 30 in. long. Measure down from the top end 5 in., square a line around the four surfaces and from this line taper the legs to ⅞ in. square, at the bottom. Then square up four pieces ¾ by 7/16 by 12 in. for the aprons. Working from a center line across the grain, measure off on each side of the center at the top edge 4 29/32 in. Do the same at the bottom edge but measure 5 1/32 in. With the sliding T bevel and try square, square the lines all around with a knife. When one apron is completed it may be used as a pattern for the other three. A mortise gauge is now used to lay out the tenons for the joints. The tenons are ⅜ by 2½ by ½ in. long.

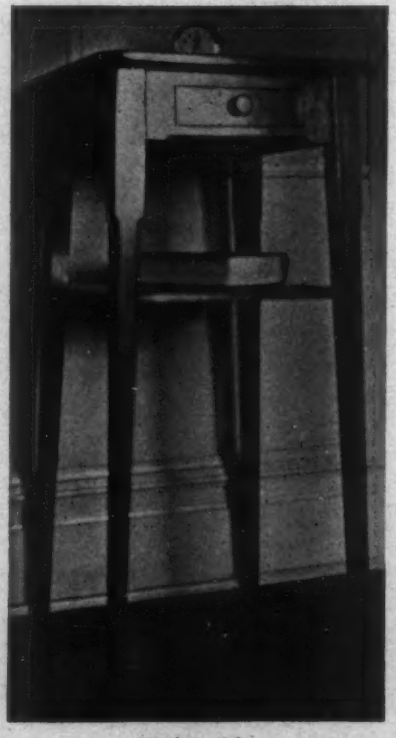
Next decide which surfaces of the legs are to receive the mortises. Identify them with a small mark. Be sure to have radial and tangential surfaces of the wood in proper alignment. Lay out the mortises to correspond with the tenons already cut. Cut the mortises and give a trial fitting with the aprons to insure accuracy. If the fits are correct, select one apron and lay out the lines for the drawer. The drawer front is 1 13/16 by 6 13/16 in. The opening is placed ¾ in. down from the top edge, and equidistant from each end. The piece can be cut out with a keyhole or turning saw. It is not advisable trying to save the stock cut out for the drawer front.

The stop chamfers on the three outside arrises of the legs and the lower outside arris of each apron may be cut next. Ample dimensions to illustrate these are given on the drawing.

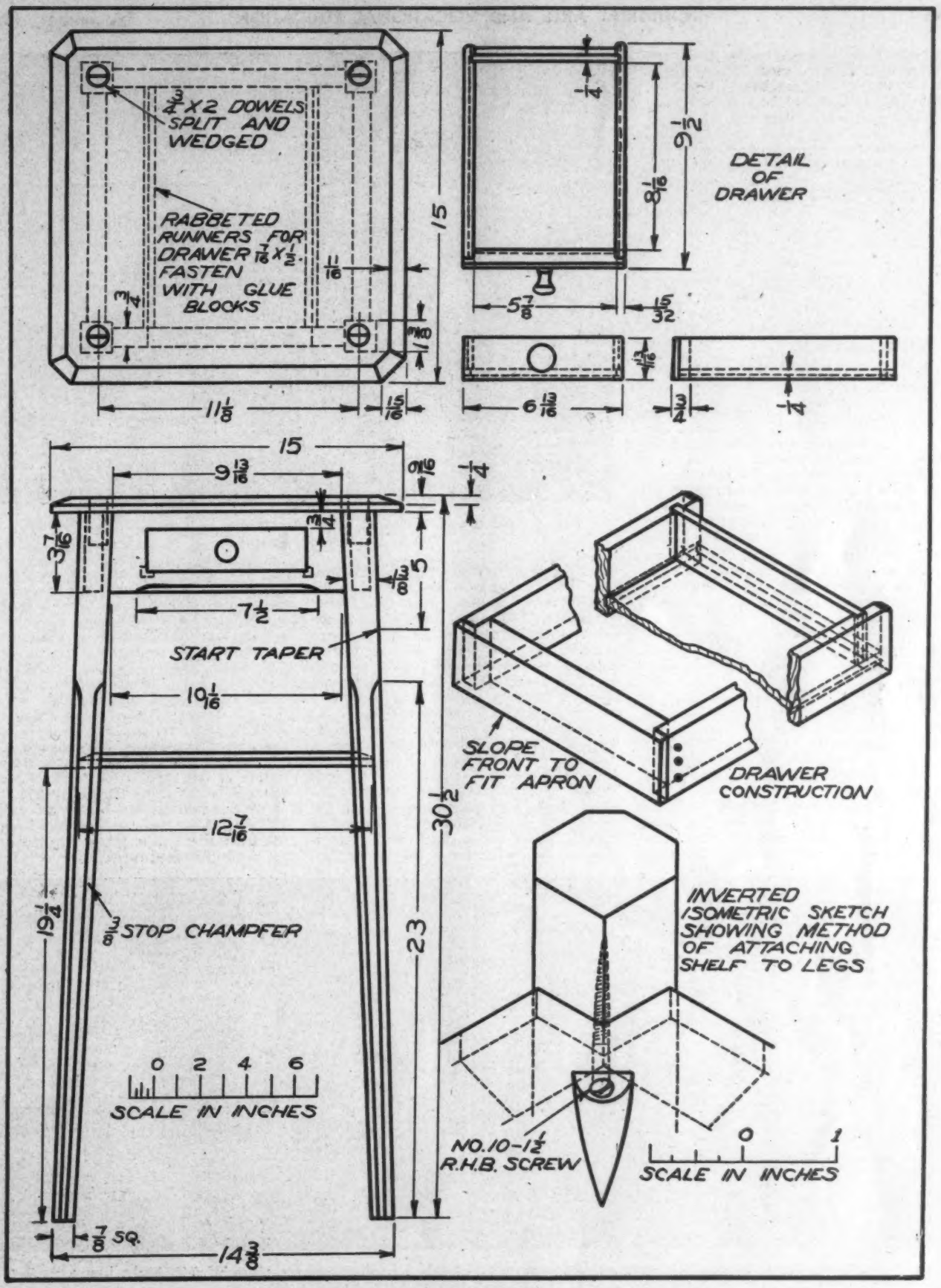
Then sponge and sand with No. ½ and 0 sandpaper. Round off all arrises. This makes the pieces ready for gluing. The waterproof glues will answer very well, but be careful not to get the glue on any visible surface, or a stain may be caused which is difficult to remove. It is best to glue opposite sides one day, and complete the job the following day, to insure squareness and stability. All glued joints should be checked while the glue is still wet, and tapered blocks should be used with the bar clamps to equalize the pressure.

While the frame is drying the shelf and top are prepared. The shelf is attached to the legs by cutting out notches 13/16 in. square on each corner and gouging a recess ⅝ in. wide by 1¾ in. long to receive the screw. The sketch gives ample information to show how to do this. On the top, four holes ¾ in. in diameter, 11⅛ in. on centers are bored to receive the pegs. In attaching the top, it is best to place the top on and hold it in place with handscrews, then continue the holes, which are already through the top, down into the upper ends of the legs 1⅜ in. deep. The dowels are split and wedged for greater security.

The drawer is of simple construction. The only point to watch out for is to have the front slope correspond with the slope on the apron. A drawer knob of suitable design harmonizing with the design and finish of



Night table



Maple night table

the table should be used. In the photograph a brass circular one is used. Drawer guides fastened to the front and back aprons with small glue blocks should be used to steady the drawer as it is withdrawn.

This table may be finished in various ways. It may be stained and waxed; or stained, coated with shellac mixing lacquer, and filled and given several coats of four-hour varnish, after which a rubbing with FFF pumice stone and crude oil will impart that professional tone. The table shown in the photograph was finished in the last-mentioned way.

REPRESENTATIVE ARRANGEMENTS FOR TEACHING ELECTRICITY IN VOCATIONAL SCHOOLS

F. THEODORE STRUCK

The Pennsylvania State College
State College, Pa.

Bell, signal, and house wiring is taught in trade and industrial schools along comparable lines but with certain modifications, some of which are illustrated herewith.

Balloon frame construction in a small, full-scale model house or parts thereof. This practice is shown in Figure 1, which shows a class in electric wiring in the Worcester, Mass., Boys' Trade School. There is nothing fancy about this shop setting but one can readily see that all available space, including overhead ceilings, girders, posts, and partitions, are used for practical instructional purposes.

Balloon frame construction with vertical panels nailed in place. This type is shown by Figure 2, a photograph taken by Day Photographers at the Hadley Vocational School, St. Louis, Mo. A narrow shelf is built at the lower edge of each panel to hold tools that are used. This plan is economical of space but has evident limitations in that it is relatively difficult to supervise a class where a view across the shop is not possible.

Balloon frame construction with removable panels. The setup for this arrangement is similar to that shown in the Hadley Vocational School with the exception that individual panels, usually somewhat smaller than those shown in Figure 2, are fastened to the studs by means of turn buttons or a similar arrangement. The panels are removed at the end of each instructional period. They are stored in some convenient place as, for example, in a rack, vertically, under a workbench, in a rack placed in a storage room adjoining the shop, or in a rack placed in a convenient location in the electric shop.

Fig. 5. Advanced electrical shop, Macomber Vocational High School, Toledo, Ohio

Wooden frames or panels fastened on workbenches. This plan is illustrated by Figure 3, showing a portion of the electric shop of the Samuel Gompers Trade School, San Francisco. Natural light from three sides, relatively low wiring frames with open spaces in them, and ample floor space enable the instructor to supervise class easily. Each workbench is provided with two furnaces for heating coppers. The storage bins under the benches are economical of space and convenient even though they present inspectional difficulties — the instructor would have to unlock them, or have the students do so, in order to see how orderly they are kept.

Telephony and Radio. The telephony and radio shop of the Clifford B. Connelley Vocational High School of Pittsburgh, Pa., is shown in Figure 4. This shop has a floor area of 28 by 65 sq. ft., exclusive of the balcony, tool, and storage rooms. It is planned for a minimum of thirty students. An outstanding feature of this shop is the series of neatly arranged booths under the gallery and compactly arranged worktables in the gallery. This doubles the available floor space in about one third of the shop. In case the gallery is not needed for instructional space, it is some-

Fig. 1. Left, electrical wiring shop, Worcester Boys' Trade School, Worcester, Mass. Fig. 2. Right, house and signal wiring, The Hadley Vocational School, St. Louis, Mo.

Fig. 3. Left, electrical shop, Samuel Gompers Trade School, San Francisco, Calif. Fig. 4. Telephone and radio shop, Clifford B. Connelley Vocational High School, Pittsburgh, Pa.

times used for locker rooms and for providing washing facilities, or for storing material or projects.

Advanced Electric Instruction. A sample installation of equipment for advanced instruction in electricity is shown in Figure 5. This view is one taken by the Wetzier Studio of Cleveland, at the Macomber Vocational High School, Toledo, Ohio. The picture shows a modern installation by the aid of which students are able to secure training that will be very useful in this electric age. The glass partitions give the sense of roominess and help to keep out dust, moisture, and noise. Note that the lower glass panels are opaque, whereas the upper ones are of clear glass. Doors of expanded metal at the ends of the switchboard add a desirable safety feature.

AN IMPROVED JOINTER STICK

V. E. BROADBENT
Union High School
Santa Clara, Calif.

For a long while the writer struggled to push thin and narrow boards across the jointer by means of a notched board with a plane handle at one end and a knob at the other, like the one shown in Figure 1. It had the disadvantages of being too light to hold the stock firmly, and brought the hands uncomfortably close to the knives. Then, too, the hands hit or rubbed against the guide fence.

Finally, he hit upon the device shown in Figures 2 and 3, and it has been such an improvement that he is passing it on to brother woodwork teachers and homecrafters. In the first place its height keeps the hands above the fence in a comfortable position and well away from the knives. Secondly, the long slot in the top permits both hands to be placed where the pressure is needed and to be changed while the stock is being run across the knives. Finally, the added weight of the heavier pusher stick prevents the stock chattering as it often did with the lighter arrangement.

It will be noted from Figure 3 that the handle and the projection at the bottom are reinforced by dowels.

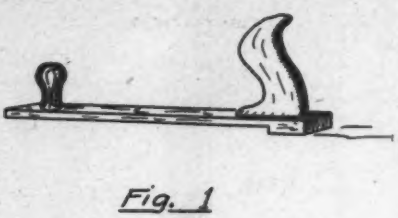
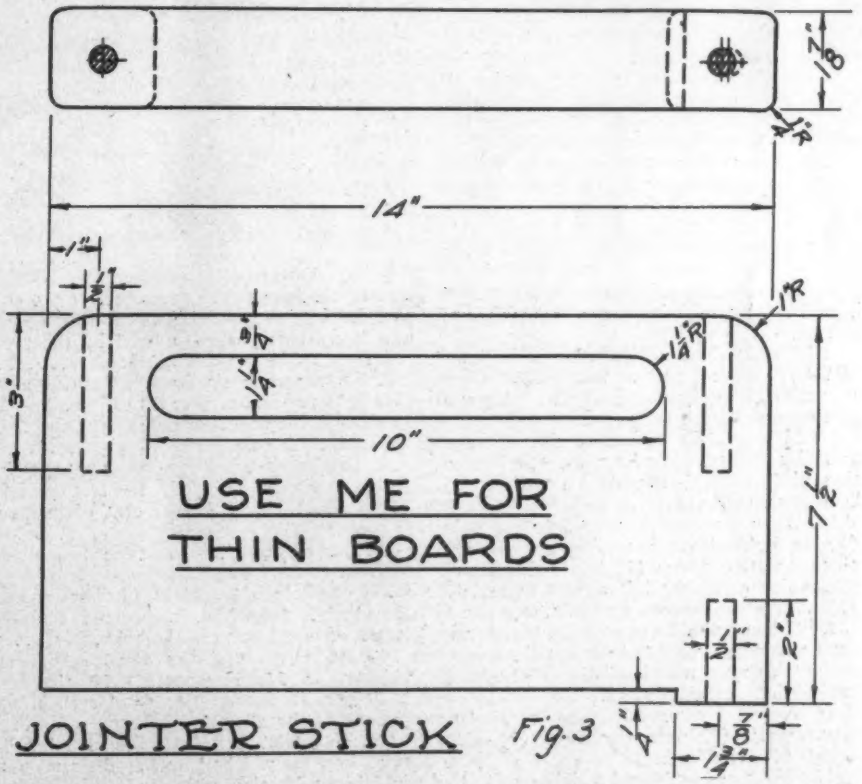


Fig. 1

Fig. 2



JOINTER STICK Fig. 3

The writer also found that the more personal appeal, "Use me for thin boards" painted on the pusher stick, brought better results than signs such as "Use this pusher stick for the jointer." He makes use of this idea of personal appeal in all safety signs, and finds that they receive a more spontaneous response than those ordinarily used.

PREFLIGHT AVIATION ENTRANCE EXAMINATION

SIDNEY S. HAY

Eastchester High School
Tuckahoe, N. Y.

Part 1

Aircraft Structure and Operation

Directions: These are multiple-choice questions. In each of the following sentences underline the word or phrase which makes the best meaning out of the statement.

1. An airplane with a single wing is called a (1) biplane, (2) aquaplane, (3) monoplane.
2. The empennage is (1) at the front of the plane, (2) on the trailing edge of the wing, (3) at the rear end of the fuselage.
3. When the stick is pulled back the air striking the upturned elevator causes the plane to (1) go down, (2) go up, (3) bank to the right or left depending upon the position of the rudder.
4. One of the most extensively used materials for finishing the interior of the plane is (1) rubber, (2) duralumin, (3) plastic.
5. In a take-off, after the plane has started to move along the ground the stick is (1) pulled back, (2) pushed forward, (3) kept neutral.
6. Of the following, the landing gear with the greatest efficiency is (1) the shock cord type, (2) the spring type, (3) the hydraulic or oleo strut type.
7. Airplane dope can be made at home by (1) dissolving a rubber balloon in alcohol, (2) dissolving a victrola record in turpentine, (3) dissolving a plastic tooth brush handle in nail polish remover.
8. Banking or raising one wing and lowering the other is accomplished by (1) changing the position of the ailerons, (2) moving the rudder controls, (3) lowering the flaps.
9. A plane with a fuselage that looks like the hull of a boat is called (1) an ornithopter, (2) helicopter, (3) a flying boat.
10. The (1) Lockheed P-38, (2) He 111, (3) Atlantic Clipper, is an example of a flying boat.
11. A plane that can land on water or land is called (1) a midwing monoplane, (2) amphibian, (3) flying boat.
12. On the floor of the cockpit, in front of the pilot, are a pair of foot pedals; these are called (1) rudder controls, (2) bank and turn controls, (3) brake pedals.
13. In order to turn left or right, besides using his rudder, the pilot must (1) lean in that direction, (2) throttle his engine, (3) bank in that direction.
14. When the stick is moved to the right (1) the right aileron moves up and the left aileron moves down, (2) the right aileron moves down and the left aileron moves up, (3) both ailerons move up simultaneously.
15. Trimming tabs are used (1) to decorate the control surfaces, (2) to adjust the control surfaces to react normally, (3) to strengthen the fabric on small planes.
16. A metal commonly used in airplane structures is (1) pure aluminum, (2) white metal, (3) duralumin.
17. Wings are supported mainly by (1) the ribs, (2) the spars, (3) the ailerons.
18. The front part of a wing is called the (1) leading edge, (2) attack edge, (3) edge.
19. In taking off the airplane usually heads (1) into the wind, (2) cross wind, (3) along with the wind.
20. The most highly useful of the following propeller types is (1) the fixed pitch type, (2) the constant speed type, (3) the electric constant-speed and feathering type.
21. The nacelle is the structure in which (1) baggage is stored, (2) machine guns are installed, (3) the engine is housed.
22. Landing wheels are made retractable (1) so that there may be less chance of their being hit by enemy bullets, (2) to improve belly landings, (3) to reduce wind resistance and thus enable the plane to fly faster.
23. The following is a high-wing monoplane (1) the Boeing Clipper, (2) the Supermarine Spitfire, (3) the Messerschmitt.
24. If you saw the side silhouette of an airplane the following would help you to identify it: (1) the shape of the fuselage, (2) the shape of the wings, (3) the number of motors.
25. The Civil Aeronautics Administration is (1) a club to which all civil airmen may belong, (2) a federal agency for distributing airplane literature, (3) a federal agency which makes and enforces aircraft regulations.

Part 1 — Test Key

1. 3	10. 3	19. 1
2. 3	11. 2	20. 3
3. 2	12. 1	21. 3
4. 3	13. 3	22. 3
5. 2	14. 1	23. 1
6. 3	15. 2	24. 1
7. 3	16. 3	25. 3
8. 1	17. 2	
9. 3	18. 1	

Part 2

Mathematics and Physics

Directions: You are to fill in the answer to each problem in the space provided for it at the right-hand side of the sheet.

1. 648.03 cm. + 37.895 cm. + 219.921 cm. + .08376 cm. = ? .....
2. 73.44 cu. in. — 8.7375 cu. in. = ? .....
3. 9,034 × 10.06 = ? .....
4. 11,415 ÷ 45 = ? .....
5. Convert .9375 to a common fraction. .....
6. At 1000 r.p.m. a propeller uses 80 per cent of the horsepower developed. If the engine develops 1500 horsepower at 1000 r.p.m. how many horsepower are used by the propeller? .....
7. For a certain air density, the true altitude is 16 per cent greater than the calibrated altitude. If the true altitude is 17,400 ft., find the calibrated altitude. .....
8. The top speed of an aircraft at 8000 ft. is 304 m.p.h. At 12,000 ft. the top speed is 352 m.p.h. What is the per cent of increase in speed? .....
9. The distance from outside to outside between two holes in a steel plate is 6 21/32 in. If one hole is 1 5/16 in. in diameter and the other is 2 1/32 in. in diameter, find the length of metal between the holes. .....
10. An alloy, used for bearings in machinery, is 24/29 copper, 4/29 tin, and 1/29 zinc. How many pounds of each in 346 pounds of the alloy? .....
11. If a pilot flies 347 miles in 3 hrs. 15 min., how far will he travel at the same rate in 7 hours 45 minutes? .....
12. On a certain day 10 temperature readings were taken on a Centigrade thermometer. They were: 6°, –3°, –7°, –15°, –4°, 0°, 2°, 3°, 5°, 3°. Find the average temperature reading. .....

Directions: The following are multiple-choice questions. Underline the word or phrase which makes the best meaning out of the statement.

13. At the earth's surface, the atmosphere exerts a pressure amounting to about (1) 16.2 lb. per sq. in., (2) 14.7 lb. per sq. in., (3) 12 lb. per sq. in.
14. As altitude increases, pressure (1) decreases, (2) remains steady, (3) increases.
15. The most abundant element in the atmosphere is (1) oxygen, (2) nitrogen, (3) argon.
16. Temperature is measured by means of a (1) barometer, (2) hygrometer, (3) thermometer.
17. The freezing point of water on the Fahrenheit thermometer is (1) 0°, (2) –32°, (3) 32°.
18. Air pressure is measured by means of the (1) barometer, (2) hygrometer, (3) thermometer.
19. A vector quantity has (1) both magnitude and direction, (2) magnitude, (3) direction.
20. The process by which energy is transmitted through space without the presence of matter is known as (1) conduction, (2) convection, (3) radiation.
21. The transferral of heat by moving matter is known as (1) convection, (2) conduction, (3) radiation.
22. For every action there is always (1) an explanation, (2) an equal and opposite reaction, (3) a certain amount of friction.
23. The unit for measuring heat is the (1) thermometer, (2) calorie, (3) millibar.
24. A device consisting of two thin strips of different metals fastened together one end fixed, and used for the automatic closing of circuits is called a (1) rheostat, (2) thermograph, (3) thermostat.
25. Work is equal to (1) force × distance, (2) force distance, (3) distance force.

Part 2 — Test Key

1. 905.92976 cm.	13. 2
2. 64.7025 cu. in.	14. 1
3. 90,882.04	15. 2
4. 253 2/3	16. 3
5. 15/16	17. 3
6. 1200 h.p.	18. 1
7. 15,000 ft.	19. 1
8. 15.8 per cent	20. 3
9. 3 5/16 in.	21. 1
10. 286.34 lb. copper, 47.72 lb. tin, 11.93 lb. zinc	22. 2
	23. 2
11. 827.46 mi.	24. 3
12. —1	25. 1

Part 3

Fundamentals of Shopwork

Directions: These are multiple-choice questions. In each of the following sentences underline the word or phrase which makes the best meaning out of the statement.

1. A bar folder is used to (1) bend bars of metal, (2) bend sheet metal, (3) fold wire.
2. Sheet metal is shaped by being bent over anvils of peculiar shapes known as (1) swages, (2) shapers, (3) stakes.
3. Before actual soldering can be done the soldering on copper must be (1) tinned, (2) washed, (3) filed.
4. For cutting across the grain of wood we use a (1) cross-cut saw, (2) backsaw, (3) compass saw.
5. The proper thinner for dope is (1) turpentine, (2) acetone, (3) alcohol.

(Continued on page 22A)

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PREFLIGHT AVIATION ENTRANCE EXAMINATION

(Continued from page 398)

6. Auger bits are marked in (1) eighths of an inch, (2) thirty seconds of an inch, (3) sixteenths of an inch.

7. A good flux for soldering galvanized iron is (1) sal ammoniac, (2) killed acid, (3) sulphuric acid.

8. Measurements in thousandths and ten thousandths of an inch can be made with the (1) inside calipers, (2) outside calipers, (3) micrometer caliper.

9. Internal threads are cut with (1) hand taps, (2) a countersink, (3) a reamer.

10. Blowtorches operate best when using (1) gasoline with lead, (2) gasoline without lead, (3) benzine.

11. Taper pins, cotter pins, etc., are best driven with (1) a pin punch, (2) a drift punch, (3) a center punch.

12. When working at the grinder always (1) wear an apron, (2) wear goggles, (3) wear gloves.

13. The process of heating and cooling a piece of metal so as to soften it is called (1) tempering, (2) hardening, (3) annealing.

14. When the teeth of a file become clogged with the material being filed you can clean them with (1) a clean rag, (2) a file card and brush, (3) compressed air.

15. A hack saw is used for (1) cutting small pieces of wood, (2) sawing large pieces of wood, (3) cutting metal.

16. Wire should be cut with (1) pliers, (2) snips, (3) scissors.

17. The instrument used for measuring the diameter of wire and the thickness of metal is called a (1) wire and sheet-metal gauge, (2) marking gauge, (3) carpenter's rule.

18. Sandpaper that is coarser than 1 is numbered (1) ½, (2) 1½, (3) 0.

19. The strongest of the following joints is the (1) glued joint, (2) nailed joint, (3) doweled and glued joint.

20. When removing insulation from an electrical wire care must be taken (1) not to dull your knife, (2) not to nick or break any of the strands, (3) not to get a shock.

21. To sand a flat wooden surface properly you should (1) scrub with sandpaper as hard as possible in all directions, (2) rub with steel wool, (3) wrap your sandpaper around a block and sand with the grain only.

22. In order to avoid binding in the wood, the teeth of rip and cross-cut saws are bent out to alternate sides. This is called (1) kerf, (2) bend, (3) set.

23. The turning saw is used by hand to do the work done by the electrical (1) circular saw, (2) band saw, (3) jig saw.

24. A gouge should be sharpened with (1) a slipstone, (2) a grindstone, (3) an oilstone.

25. Cold chisels are used for (1) splitting thick pieces of wood, (2) chipping or cutting cold metal by hand, (3) cutting apart sheet metal.

Part 3 — Test Key

1. 2	10. 2	19. 3
2. 3	11. 1	20. 2
3. 1	12. 2	21. 3
4. 1	13. 3	22. 3
5. 2	14. 2	23. 2
6. 3	15. 3	24. 1
7. 2	16. 1	25. 2
8. 3	17. 1	
9. 1	18. 2	

Filing Hints to meet war-time needs

USE THE CORRECT PRESSURE IN FILING

FILE TEETH cut only on the forward stroke. Accordingly, the file should be carried forward on an almost straight line, applying the pressure first with the left hand at the beginning of the stroke, then with both hands equally in the middle of the stroke, and finally with the right hand alone at the end of the stroke.

Just enough pressure should be applied to keep the file cutting efficiently. If too much pressure is employed, the teeth are likely to clog and cause the file to slide or glaze over the work. Or the teeth may even shell off. Keep in mind that a new file bites into the work more readily than an old one and for this reason should be used lightly at first.

Except when working on soft metal, the return stroke should be made with the file lifted clear of the work.

☆ ☆ ☆

Because of its patented "Wavy Teeth" design, incorporating a scientific balance of coarse teeth and fine teeth precisely placed in wavy rows, the NUCUT File cuts faster, better, with less effort.

WRONG: Don't exert too much pressure when filing. It is likely to cause excessive tooth clogging, heavy wear, and may even cause the teeth to strip and the file to break.

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Questions and Answers

LACQUER FINISH FOR MAHOGANY

1097. Q.: The writer has on hand your book, *Wood Finishing and Painting Made Easy*. In finishing new Philippine mahogany we sponged the wood with a weak glue solution made from one cup of hot cabinetmaker's glue to a 12-quart pail of hot water.

We then stained with water stain, permitting adequate time between glue sizing and staining. Next comes our problem, for apparently no one out here seems to be familiar with your shellac-mixing lacquer which you recommend as a sealer coat to be used under lacquer.

In its place they seem to believe that what they call their sanding lacquer, or sanding sealer, is one and the same thing. This sanding sealer is thinned, of course, with lacquer thinner. My question is: "Is the sanding sealer proper to use or would this shellac-mixing lacquer be better, since the shellac-mixing lacquer would be thinned with alcohol."

We would appreciate some further description from you regarding this subject since the writer intends to finish practically all of his work with lacquer. On work which he attempted to do with the use of lacquer sanding sealer, when the sealer coat was applied *over* the filler, the filler seemed to be raised, indicating perhaps that

(Continued on page 24A)

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Fundamentals of Shopwork
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just drop us a line on your school stationery, addressed to our Educational Department, and ask for Project 7.

May we remind you who are on our mailing list to return the postcard sent with our letter of September 15, so that you will be sure of receiving all our future educational material.

BEHR-MANNING (DIVISION OF NORTON COMPANY) **TROY, N. Y.**

(Continued from page 22A)

we used too much oil color in coloring the natural wood filler which we purchased.

The writer feels quite sure that sufficient time was allowed for the filler to dry, but in view of the fact that natural wood filler requires a considerable amount of oil color to tone it down to the darkness of mahogany, perhaps the drying effect was retarded too much.—*G. P. C.*

A.: The shellac-mixing lacquer mentioned in my book, *Wood Finishing and Painting Made Easy*, is the *Water White Shellac-Mixing Lacquer* sold by Murphy and Company Varnish Manufacturers of Newark, N. J., and is very satisfactory for the purposes specified. If you cannot get it, by all means use the sanding sealer made by the manufacturer of your wood lacquer. Do not use goods of different firms in the same schedule of a finish of this type. That is the reason why you are having trouble with the swelling of the filler which must have dried at least 48 hours before applying the lacquer. This latter must be sprayed as a mist coat only in the first application. It must then be allowed to dry, and after sanding with 6/0 finishing garnet paper moistened on the back, a full bodied, double coat should be sprayed on. By the term *double coat* is meant that the first coat is applied across the grain and the second is laid on immediately by spraying with the run of the grain using a full wet surface at all times.

There is considerable doubt in my mind at this time as to the advisability of using lacquer as a finish on mahogany. In the first place here in the East no lacquer may be sold to the public or commercial plants at all unless it is to be used on strictly military projects. In the second place, I am quite sure that you will like both the ease of application as well as the final result if you will use DuPont penetrating wood finish instead. I have just put through a run of hospital equipment for the American Red Cross in American maple and DuPont which is outstanding in every way. I suggest that you get a can and try it out first, as Philippine mahogany is an exceedingly difficult wood to finish correctly in lacquer.—*Ralph G. Waring.*

Personal News

ELECTED STATE COMMISSIONER OF EDUCATION OF MINNESOTA

Dean M. Schweickhard, formerly assistant superintendent of schools at Minneapolis, Minn., has been elected to the position of state commissioner of education for Minnesota.

Dean M. Schweickhard

Dr. Schweickhard, a native of Mankato, secured his elementary education in the practice school of the State Teachers College. He completed two years of professional preparation for teaching, then entered the College of Engineering at the State University in 1914–15, and the following year enrolled at the University of Wisconsin where he was graduated with the degree of bachelor of arts in 1916. In 1927 he secured the degree of master of arts from the College of Education at the University of Minnesota together with a major in the field of vocational education.

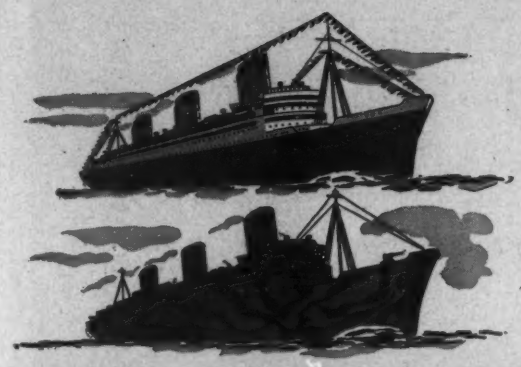
His teaching experience was largely in the fields of manual training, geometry, and English, having served as teacher, principal, assistant professor of trade education, director of industrial arts, and state supervisor of trade and industrial education. During recent years he has been serving as principal of the Miller Vocational High School in Minneapolis and as assistant superintendent of schools.

APPOINTED DIRECTOR OF FOREMANSHIP AND APPRENTICESHIP TRAINING

R. M. Hammes, newly selected director of the new foremanship and apprenticeship training program at American Machine and Metals, Inc., East Moline, Ill., comes thoroughly trained and experienced in such work after 25 years in the field of industrial arts and vocational education in the public schools of Wisconsin and Iowa. Mr. Hammes holds a B.S. degree in industrial and vocational education from Stout Institute, and a M.S. degree from Iowa State College. He has completed some work for the Ph.D. degree at Ohio State University, and has studied architecture at Columbia University.

From 1922 to 1939 he was engaged in teaching shopwork and drafting at Council Bluffs and Davenport, Iowa. During the period from

(Continued on page 26A)



EVEN THE "QUEEN" MUST CHANGE HER DRESS

Once they called her a "Luxury Liner". She sailed with banners waving and her brightly-painted sides glistened in the sun. Now, with her gay colors gone, she does a grimmer, harder task. Appearance alone has changed—and Plumb, too, looks different in its new service "uniform". There is less polish and gleam—eliminated by government order, for the duration.

But Plumb quality has not changed! You'll always recognize Plumb—by the tested hickory handle; by the correctly-tempered one-piece steel head; by the graceful lines of each perfect tool and by the ease and speed with which it works. Master craftsmen have designed these tools to do your job quicker and better. Fayette R. Plumb, Inc., 4837 James Street, Philadelphia 37, Pennsylvania.

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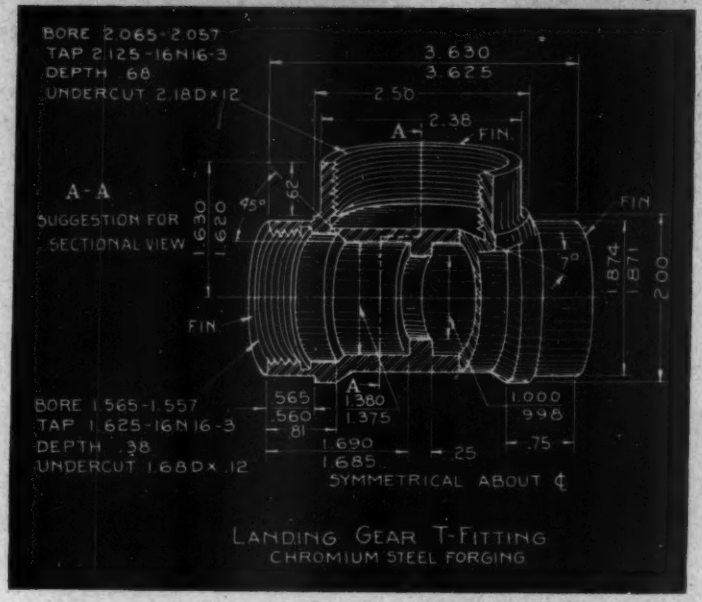
TOOLS ARE VITAL FOR VICTORY
BUY ONLY WHERE VITALLY NEEDED

PORTRAIT OF A PROBLEM

Here's another classroom problem from the famous Dixon series. Just watch your student draftsmen handle this one! Ask them to draw the correct orthographic views.

But first, give your students a boost in the right direction by having them all use *Typhonite* ELDORADO pencils. The Typhonite process produces leads of unsurpassed uniformity. Utmost smoothness and denseness are thereby attained. And Typhonite leads are made to stand heavy pressures. When you check over drawings made with *Typhonite* ELDORADOS, notice the clarity of hair-lines. Typhonite lead particles hold together—they don't "feather" a line.



SOLUTION: We will send you a free blueprint showing the solution of this problem. Write to the address below within 30 days. Specify Blueprint No. 128-J11.

TYPHONITE

ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY, N. J.

(Continued from page 24A)

1926 to 1930 he was in charge of apprentice training for the Union Pacific Railway. He served as engineering draftsman for Midwest Engineering Company, Council Bluffs, during the summers of 1928 to 1933. Mr. Hammes was engaged as part-time instructor in drafting in the industrial education department, Iowa State College, while obtaining his master's degree. He has had considerable shop experience in various companies and during the summers of 1941 and 1942 was employed as draftsman at the Rock Island Arsenal.

He holds membership in the following organizations: Epsilon Pi Tau and Phi Delta Kappa, honorary industrial and educational societies; American Vocational Association; American Industrial Arts Association; and Society for Promotion of Engineering Education. Mr. Hammes also was president of the Iowa Industrial Arts Association for the years 1933–34 and 1934–35, and was the organizer of the 25-year club in Iowa as an honorary organization in recognition of years of service in public education.

R. M. Hammes

COMMISSIONED MAJOR

DR. WILLIAM E. WARNER, who recently has been commissioned a major in military government, spoke on "The Enriched Nature of Industrial Arts and Certain Wartime Pressures That Presage the Future" before a conference of city and state officials, teacher educators, publishers, manufacturers, and distributors in Cleveland, Ohio, on August 26, 1943. He addressed the War Plant Protection Association of Massachusetts in Springfield on September 20, 1943, on the topic, "The Civilian Defense of Industry." On October 22, 1943, he will address the Delaware State Education Association in Wilmington on the topic, "Industrial Arts Education in the Decade Following the War."

Dr. William E. Warner

♦ PHILIP M. WAGNER has been appointed director of the Newark School of Fine and Industrial Arts, Newark, N. J., replacing Mr. Gustave Cimiotte.

Mr. Wagner is a past president of the New Jersey Vocational and Arts Association and past president of the New York School Crafts Club.

♦ HARRY J. PATTERSON recently joined the Vermont state department of education as state teacher trainer in trade and industrial education. He will be located at the University of Vermont, Burlington, Vt. In addition to his duties as state teacher trainer in the regular program of trade and industrial education and industrial arts, he will have general supervision over the training-within-industry part of the war-production training program, and will promote foreman training.

Mr. Patterson was formerly an instructor at Newton Trade School, Newton, Mass. For the past year, while on a leave of absence from this institution, he was engaged in foreman training at the Watertown Arsenal and at industrial plants in the vicinity of Boston. For a number of years he had served part time as state teacher trainer for the vocational division of the Massachusetts department of education.

♦ The following Kansas superintendents and high school instructors did their bit by working in industry this summer:

Glenn Day, El Dorado — final assembly at Boeing Airplane Co., Wichita;

K. K. Nelson, Newton — electrical assembly, Boeing Airplane Co., Wichita;

Supt. H. H. Robinson, Augusta — draftsman, White Eagle Refinery, Augusta (this was his ninth summer of such work);

R. R. Reed, Salina — training supervisor at the Smoky Hill Air Base, Salina;

Wm. R. Alair, Dodge City — contracted to build a dwelling.

(Continued on page 29A)

Your Training Courses ...NOW MORE IMPORTANT THAN EVER!

YOU know that the immense wartime need for craftsmen has emphasized the vital importance of proper training. And you know that the opportunities already apparent in the postwar world will call for even more well trained workers.

You instructors have always realized how fundamental in the making of good craftsmen are the knowledge and appreciation of good tools. That's why so many school workshops are equipped with tools by Disston—tools which, now more than ever, are proving the wisdom of investing in *quality!*

These long-lasting quality tools of fine Disston Steel are, naturally, very much in demand for urgent war jobs, and, consequently, their availability is limited. However, if you are training students for *essential* work and require tools, see your hardware dealer about tools by Disston.

- The Disston Saw, Tool and File Manual will be supplied *free* to your students by local hardware dealers. It is a valuable, practical help for young craftsmen.
- If *you* want educational charts and other useful material for classroom and workshop work, they're yours for the asking. Write today.

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WEIDENHOFF

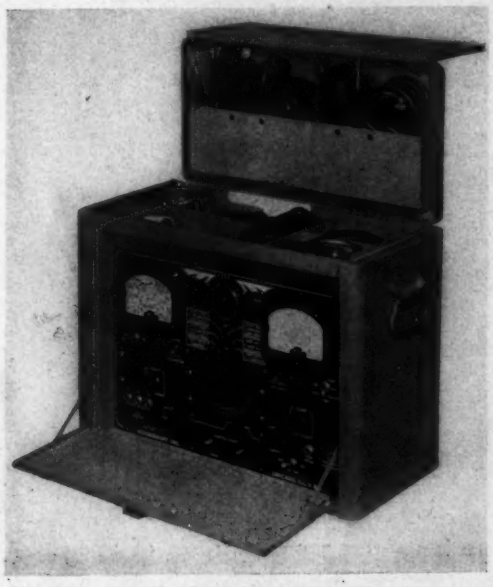
Automotive - Aviation

SERVICE EQUIPMENT

TAKE CARE OF YOUR EQUIPMENT

The greatest good is obtained from automotive electrical testing equipment if a little time is taken to keep it in good operating condition. Equipment of this kind incorporates many precision built units which should be carefully protected to insure accurate results over long periods of use. School instructors are urged to check up on the condition of their Weidenhoff equipment particularly now when school activities are getting under way.

Below are given a few timely suggestions that will help to attain the results desired. These precautions will help to keep test equipment at peak efficiency and reduce the need for maintenance.



MODEL 1019 ENGINE ANALYZER

A fully illustrated treatise on automotive electric systems, magnetism, battery ignition and high tension magnetos.

Sent FREE for limited time to instructors requesting it on their letterheads. Regular price $1.50 each.

SOME TIMELY TIPS

All switches of a test bench or other apparatus should be in the OFF position when the equipment is not in use. It provides protection to the meters.

Be exceedingly careful of voltmeters, ammeters, etc. They may be damaged and replacement may be impossible.

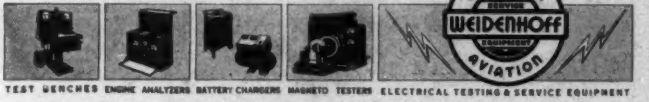
Take exceptionally good care of all test leads. Keep them free from oil and grease.

If amperage or voltage is to be checked be sure to select a scale high enough so the meter will not be damaged.

At regular intervals wipe off any trace of moisture and keep the equipment in a dry place. Your testing equipment will have to do for the duration. Conserve it in every way possible.

KEEP BUYING WAR BONDS AND STAMPS

JOSEPH WEIDENHOFF, INC., CHICAGO 24, ILL., U. S. A.

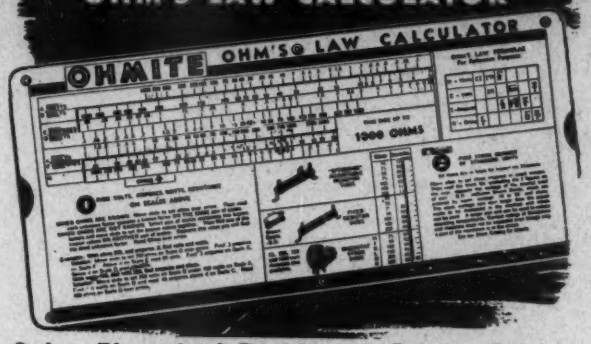


TEST BENCHES ENGINE ANALYZERS BATTERY CHARGERS MAGNETO TESTERS ELECTRICAL TESTING & SERVICE EQUIPMENT

SEND FOR THIS HANDY

OHMITE

OHM'S LAW CALCULATOR



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BE RIGHT WITH OHMITE Rheostats Resistors Tap Switches

Thousands used in the training program today. Helps students figure ohms, watts, volts, amperes—quickly, easily. Solves any Ohm's Law problem with one setting of the slide. No slide rule knowledge necessary. All values are direct reading. Two sides cover the range commonly used in electrical and radio work. Size, only 4⅛"x9". Send only 10c in coin to cover handling cost.

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ALLIED RADIO

(Continued from page 26A)

♦ Other summer jobs of Kansas educators:

W. J. Newell, printing instructor at Parsons, Kans., worked as operator-machinist on *The Parsons Sun.*

E. J. Logsdon, auto-mechanics instructor at Lawrence, Kans., conducted two OSY–A courses in auto mechanics.

D. F. Schultz, machine-shop instructor, Kansas City, Kans., instructed in the War-Production Training Program during the summer.

Roland A. Cox, printing instructor, Salina, Kans., worked in the school printing shop.

P. W. Chamness, director of vocational education, Topeka, Kans., became an approved job instructor trainer and conducted several sessions of J.I.T. in Topeka and other cities.

John E. White, printing instructor, Pittsburg, Kans., worked as a printer in one of the local plants.

♦ Clifford K. Lush, supervisor of industrial arts, Minneapolis, Minn., has been assigned added duties. His title now is supervisor of vocational education and industrial arts.

♦ George J. Frey, co-ordinator of Research and Publications with headquarters in the Topeka, Kans., office, has been called to the service of our country. He has served nine months with the Kansas State Board for Vocational Education.

♦ Ray Crail, supervisor of the Day Trade program at High School East, Wichita, Kans., is now with the War Manpower Commission as co-ordinator of the training programs of the various federal agencies assisting in the training of workers for industry. Mr. Crail had been in the Wichita schools for 18 years.

♦ M. R. Brown, machine-shop instructor at Coffeyville, Kans., has resigned to accept a position at the Acme Foundry in that city.

♦ M. L. Wilbershide and Mr. Zook, Altamont, Kans., auto-mechanics instructors, made extensive machinery repairs and building improvements in their school shop.

♦ J. H. Douglass, supervisor of the Day Trade program, Winfield, Kans., worked in the Education Division at Boeing Airplane Co., Wichita, Kans., this summer.

♦ John Biddle, drafting instructor, Wichita, Kans., did drafting at the Coleman Lamp Co., Wichita, during the summer.

♦ Charles Henderson, auto-mechanics instructor, Wichita, Kans., repaired equipment at the war-production training unit in Wichita, during the past summer.

There is no defense or security for any of us except in the highest intelligence and development of all.— *Booker T. Washington.*

Association News

♦ The Tulsa Manual Arts Club met for its first session of the school year 1943–44 on September 15, at the Bradford Hotel, Tulsa, Okla. This club was organized in 1924, when Dr. Wm. T. Bawden was association superintendent of schools and director of industrial education for the Tulsa public schools, and has met regularly each month for the past 18 years.

The personnel of the club is made up of the male members of the industrial-education teaching staff and director. This year the membership includes 36 men teaching industrial arts, trade and industrial, and trade and industrial educational work in Tulsa. The club also has many associate members, including Dr. H. W. Gowans, superintendent of public schools; Dr. Charles C. Mason, assistant superintendent of schools; and Mr. Byron Shepherd, assistant superintendent of schools; members of the state department of trade and industrial education; and a number of the principals of the high schools in Tulsa.

At the first meeting a résumé of the activities of the membership for the summer revealed that 90 per cent of the members of this club were working in war industries or instructing in war-production training or industrial-arts shopwork throughout the summer months. The majority of these men were working in one of the two aircraft manufacturing plants in Tulsa.

The annual initiation program was carried through, initiating new members who have joined the teaching staff in industrial education during this year and since January 1, 1943.

The next meeting will be held October 13, 1943. —*C. O. Weger,* Co-ordinator, General Continuation Schools.

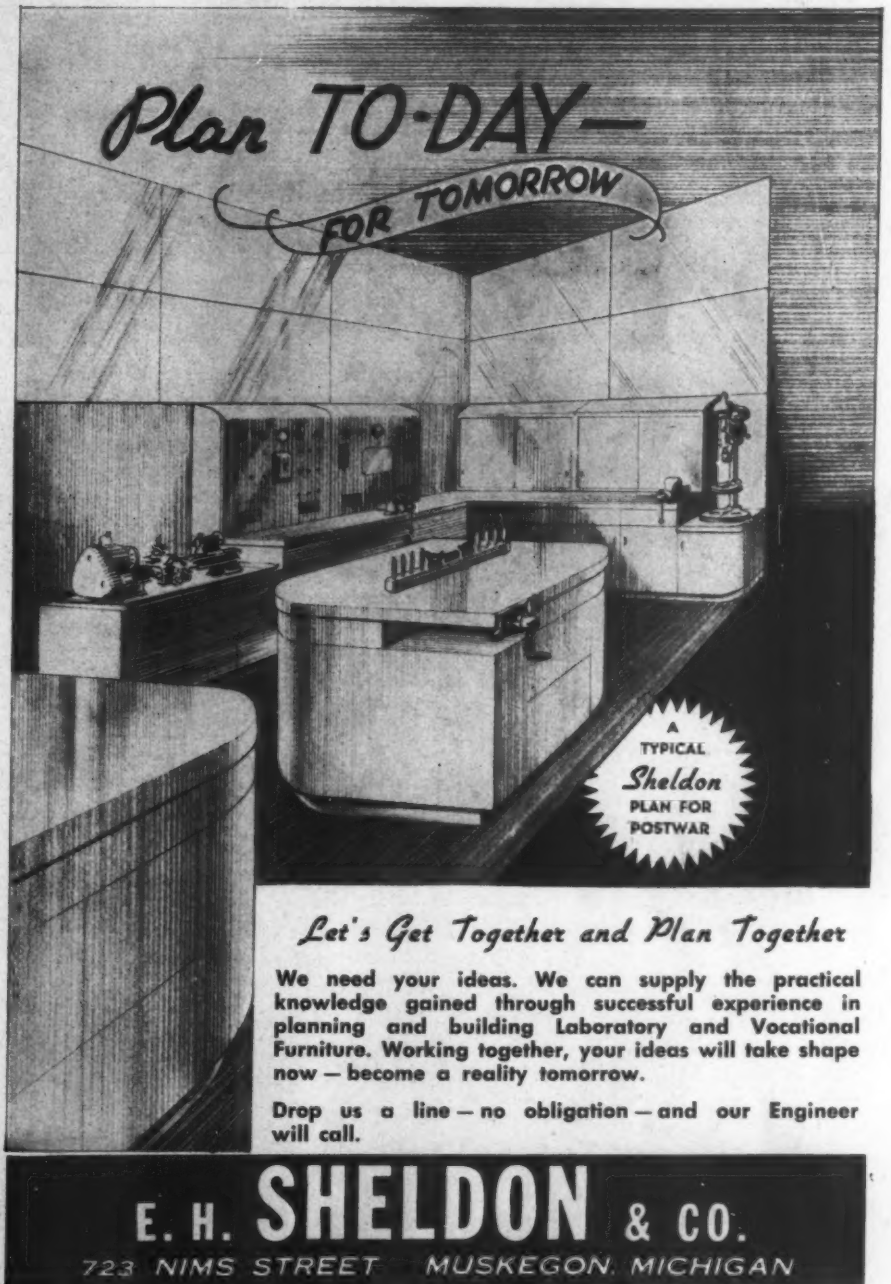
♦ The Wisconsin Industrial Arts Association will hold its convention on November 4 and 5, 1943, at Milwaukee.

The general meeting will be held on Thursday, November 4, at two o'clock at Marquette University. The speaker on this occasion will be Dr. John Guy Fowlkes from the University of Wisconsin, and he will speak on the subject, "Education for All." The chairman of this meeting will be Leslie Brown, Delavan, Wis., president of the Wisconsin Industrial Arts Association.

For Friday afternoon, Vice-President Harvard C. Smith, Kenosha, has arranged a number of sectional meetings.

H. J. Shufelt, supervisor of industrial arts, Racine, Wis., is the secretary-treasurer of the association.

♦ The New England Industrial Arts Teachers Association has canceled its usual convention for this year.



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News Notes

♦ The new Office of Vocational Rehabilitation in the Federal Security Agency to administer the expanded federal state civilian rehabilitation program provided under the Barden-LaFollette Act of July 6, 1943, was recently announced by Federal Security Administrator Paul V. McNutt.

Michael J. Shortley, formerly assistant director in charge of field operations of the Social Security Board's Bureau of Old-Age and Survivors Insurance, has been appointed director of vocational rehabilitation and will head the new office.

John A. Kratz, transferred from the division of vocational rehabilitation of the Office of Education, will be the associate director. Both appointments represent advancements within the Federal Security Agency.

The expansion of the program will contribute to the war effort by facilitating re-employment of the physically handicapped through provisions for physical restoration where possible and training necessary for employment. Federal grants to states for vocational rehabilitation have been authorized by Congress since 1920. The program was placed on a permanent basis by the Social Security Act in 1935, and the federal appropriations were increased by the Social Security Amendment of 1939. Since early in 1940 federal interest has been particularly directed toward aiding the states to train more handicapped workers for war jobs.

♦ "The Construction of Light Airplane" was photographed at the Piper Aircraft Corporation plant in Lock Haven, Pa., by the film production unit of the Pennsylvania State College's extension audio-visual aids service.

An all college judging committee described the film as "The best film that has been submitted for use in preflight courses." It has been placed in 82 libraries of the *National Educational Library Association* for distribution to schools, colleges, and other organizations interested in preflight education and instruction. This film also may be useful in adult and high school preflight courses to familiarize students with the nomenclature and appearance of the constructional details of an airplane and in vocational guidance groups for illustrating the various types of work done in manufacturing an airplane.

♦ Anticipating the heavy demand for printing presses after the war, the American Type Founders is offering printers the opportunity to get in line for postwar delivery of Little Giant, ATF Kelly and "Chief" offset presses. The plan is called the *Civilian Priority Delivery Assignment Agreement,* by which ATF promises to deliver the particular press, when manufactured and ready for delivery, and the printer acquires the right to purchase the press in a prescribed order of rotation. The order of rotation is determined when the printer makes application for a press, or presses, and the application is filed in the general office of the company at Elizabeth, N. J. Application forms are also available from the company's branch offices, or dealers, and from any ATF salesman.

This plan has a number of advantages for the potential buyers of new presses as well as for ATF. Realizing the need for new equipment to replace that worn out in war work, the American Type Founders' plan provides a method whereby the first new machines to be manufactured will be made available to those who need them, and can anticipate their needs now. By ascertaining the probable demand of presses, and the kind and size needed after the war, the company will be enabled to schedule its production farther ahead and can, therefore, get under way that much faster. Raw materials will be more easily ascertained under this plan because the company will be able to concentrate on those machines that are needed first.

♦ The Extension Division of the University of Wisconsin at Madison, Wis., is offering correspondence courses on "The Properties and Uses of Wood" and "Kiln Drying of Lumber." Both were prepared by Arthur Koehler, wood technologist of the U. S. Forest Products Laboratory and lecturer in forest products at the University of Wisconsin.

(Continued on page 32A)

For The Young Men Who Will Be Our Next Leaders

Central sprayhead of the Bradley gives each student clean running water. Eight to ten can wash simultaneously.

Modern group wash fixtures as used by the thousands in schools and industry—give to each individual the opportunity of washing in clean running water for maximum sanitation.

One Bradley Washfountain cares for eight to ten simultaneously, saves water and space,—reduces time and cost of installation. Instead of 24 to 30 piping connections as needed for eight to ten "single-person" wash basins,—a Bradley to serve the *same* number of washers, requires only 3. Much critical metal is conserved, besides which the amount of brass now used in Bradley is only 10% of what was used formerly and the big bowls and pedestals are precast stone or marble, both non-critical materials.

Catalog 4308 will help you plan your washroom—write for a copy. BRADLEY WASHFOUNTAIN CO., 2269 W. Michigan Street, Milwaukee 1, Wis.

Below: Bradley Multi-Stall Showers with two Bradley Washfountains at left.

BRADLEY *washfountains*

AND MULTI-STALL SHOWERS

This is a Christmas opportunity

Train Better Welders Faster with these Airco Instruction Books

OXYACETYLENE WELDING & CUTTING

Vol. 1, Lectures. Introduces the student to fundamental gas welding methods. It explains the design and operation of welding and cutting torches, tips and regulators and describes properties of various metals as well as practical welding methods used in industry. **Vol. 2, Exercises,** presents a series of carefully planned exercises that help the student to quickly learn practical methods for welding the most commonly used metals. Each volume is bound in a hard cover. Price $1.00 per copy.

ARC WELDING

Vol. 1, Lectures. Acquaints the student with fundamentals of electricity, its application to welding, and the operation of welding machines. **Vol. 2, Exercises** begins with the basic operation of striking an arc and covers welding with all types of electrodes. Standard tests are included to help the instructor determine the student's progress. Bound in a hard cover. Price $1.00 per copy.

INSTRUCTIONS IN AIRCRAFT WELDING (*Oxyacetylene*)

This volume provides a well-planned series of workroom exercises that demonstrate the specialized techniques used in oxyacetylene welding for the aviation industry. Its 36 pages are profusely illustrated to show clearly proper torch manipulation, application of filler metal, and methods for making all types of welds used in aircraft fabrication.

Price $.50.

Free inspection privileges are provided for each of the above books. Special discounts to teachers on single copies, and quantity discounts for students. Write to Air Reduction, Advertising Department, 60 East 42nd St., New York.

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AIRCO WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

(Continued from page 30A)

These courses offer opportunities for acquiring a fundamental knowledge of the structure and properties of wood, including its defects, and of operations necessary in the efficient utilization of wood.

Persons residing in any state or territory are permitted to enroll.

♦ Cooperative part-time students in the ten business education programs in Kansas earned a total of $35,191.83 in 1942–43. These earnings may be broken down as follows:

125 students in 6 retail programs .... (two programs started at midyear)	$25,109.59
39 students in 2 office programs	6,722.22
32 students in 2 combination programs	3,360.02
	$35,191.83

♦ The Russell C. Roshon Organization, State Theatre Bldg., Pittsburgh, Pa., has just added distributing centers No. 11 in the Pacific Bldg., San Francisco, and No. 12 in the Little Bldg., Boston, for distributing major 16mm. sound films to nontheatrical projector owners from coast to coast.

In addition to a large catalog listing hundreds of motion pictures for all purposes, Roshon issues "Film Fax" which is furnished to all users of 16mm. sound films.

♦ A new catalog entitled "New Tools for Learning" has been prepared by the New York University Film Library, Public Affairs Committee, Inc., and the University of Chicago Round Table. Of special interest to program chairmen, librarians, and educators, the films, recordings, radio transcripts, and pamphlets listed all provide channels of communication for information and ideas. New York University Film Library, 7 West 16th St., New York City.

♦ Faculty members of the University of Texas, Austin, Tex., report that remarkable strides were made this summer as 15 students from six Latin-American countries in a new Latin-American Workshop sought to conquer the English language. Those enrolled in the workshop included teachers from Costa Rica, Paraguay, Ecuador, and Mexico; and students from Nicaragua, Venezuela, Mexico, and Costa Rica. The new workshop enabled them to spend eight weeks in concentrated study of English before tackling other university courses. They were taught by specialists in the field — teachers of English and of speech who had been specially trained in the teaching of English as a second language.

♦ A new school War Savings poster entitled "Help Send Them What It Takes to Win," has been prepared by the Education Section, War Finance Division, Treasury Department, Washington 25, D. C. This poster is 22 by 28 in., and is in four colors. It depicts a large debarkation scene which is framed with a series of small illustrations of other pieces of military equipment with the prices approved by the War Department.

♦ In line with its policy of placing every man where he will do the most good, Army authorities, in cooperation with the War Efforts-Graphic Arts Division of the Sherwin-Williams Company, recently inaugurated classes in the military applications of the silk screen printing process at the Cleveland College Division of Western Reserve University in Cleveland, Ohio. Over two hundred qualified officers and enlisted men with civilian experience in commercial art, silk screen work, sign painting, and allied graphic arts were selected for special training.

♦ The Dravo Corporation, 300 Penn Ave., Pittsburgh, Pa., has recently developed a method for obtaining output temperatures between 150 deg. F. and 350 deg. F., with the heated air free from contamination, from coal or oil burning direct fired heaters. These high temperatures are obtained from heaters with carbon steel combustion chambers by means of a recirculating device. Such heaters are available for oil, gas, or coal as fuel, and heaters designed for coal can be converted to oil or gas when conditions make such a change necessary. Bulletin No. 510 describes this method more fully, and can be obtained by writing to the firm mentioned.

This firm also produces the Identometer, an electrical instrument for identifying instantly and accurately, by the use of reference specimens, any ferrous alloy.

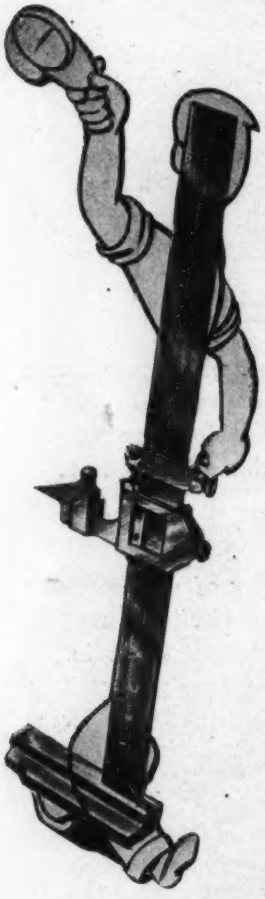
This machine is about the size of a small cabinet radio and can be used in a laboratory, or in shops, warehouses, freight cars, etc., to classify "unknown pieces" or lots of steel according to: heats (identical analysis); grades (similar analysis); types (dissimilar analysis); heat treatments (identical analyses with dissimilar structure); and composite types (two and three plies, clad metals, shear knife, etc.). The Identometer can be used to identify metals in any stage of their working from the ingot onward if cooled to room temperature. Bulletin No. 543 describes how this instrument works.

♦ A new material that may outmode rubber in automobile inner tubes and numerous other products was announced by the Glenn L. Martin Company.

This new elasto-plastic known as Marvinol has already demonstrated its superiority to both natural and synthetic rubber for such varied applications as automobile inner tubes, elastic gloves for home, hospital, and laboratory use, and many general household and industrial uses.

Marvinol is neither a synthetic rubber nor a rubber substitute, but a new material with properties all its own. It is a vinyl-type plastic. Its basic ingredients are coal, air, salt, and water, and the manufacturing processes involved in its production are far less complicated and expensive than those used to produce other synthetic rubbers.

(Continued on page 34A)



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PRECISION WORKMANSHIP"

"Speaking for myself and the hundreds of thousands of other Starrett Precision Tools engaged in war production, I can testify to the importance of your contribution to America's tremendous production program. You have instilled the "know how" and the appreciation of fine tools without which *our* contribution to the war effort would not have been as effective.

"And, let me tell you, the makers of STARRETT TOOLS are fully aware of the fine job you are doing. They are backing you up by maintaining the high standards of craftsmanship and precision that have made STARRETT TOOLS 'Standards of accuracy' for more than seventy-five years."

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World's Greatest Toolmakers

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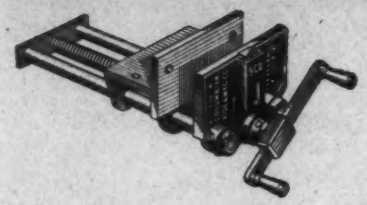
COLUMBIAN VISES

A VISE FOR EVERY NEED AND PURPOSE



★ Columbian Continuous Screw Woodworker's Vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

Quality and performance of Columbian Vises are responsible for their popularity in school shops. Train students with the vise they will use in the future. Undoubtedly it will be a COLUMBIAN, because Columbian is the world's largest producer of vises with a reputation for doing its job well. This reputation we will carefully guard.

Awarded April 8, 1943
Star added Oct. 8, 1943

★ Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

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THE WORLD'S LARGEST MAKERS OF VISES

Six High Duty Hydraulic Types, with and without Bar Feed.

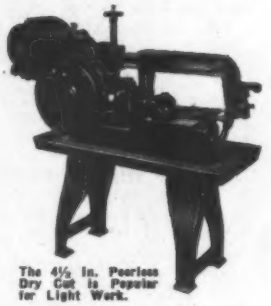
Standard Models in Three Sizes for Maintenance and General Utility Metal Cutting.

Train Them on the Metal Cutting Machines Preferred in Industry

Aboard ships of the U. S. Navy, Peerless Standard Metal Cutting Saws are in use. This is also "the handiest tool in the shop" throughout industry.

Where high speed, precision sawing is required, the Peerless High Duty Hydraulic, with the channel-type Four-Sided Saw-Frame Assembly, is preferred. For light work the Peerless Universal Dry Cut assures satisfactory power cutting for production and maintenance.

Peerless bulletins should be in your reference files. Glad to send you a complete set. Mail the coupon.



The 4½ In. Peerless Dry Cut is Popular for Light Work.

PEERLESS MACHINE COMPANY
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PEERLESS MACHINE COMPANY, Dept. IAV-1143, Racine, Wis.
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THE ONLY METAL CUTTING SAW WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE Sawing DEMANDS PEERLESS BLADE CONTROL

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ATKINS Silver Steel SAWS

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Realistic Training

FOR THE HOME FRONT ARMY

Like military instructors, manual training teachers find there is no substitute for training men under what approximates actual battle conditions. That's why many of the Nation's largest schools use Atkins Silver Steel Saws to teach the correct fundamentals. These are the same saws that graduates will find in wide use throughout industry—saws with outstanding qualities of endurance, saws correctly designed to cut easy and smooth, saws of every type for any cutting job.

Get Atkins New Wall Chart on Saw Fitting . . . It's Free

This new teaching aid shows the proper methods of filing and setting saws. On heavy paper, suitable for wall mounting. Write for a copy today.

E. C. ATKINS and COMPANY • 404 South Illinois Street, Indianapolis, Ind.

(Continued from page 32A)

Marvinol has properties of reclaimability due to its thermoplastic nature, superior abrasion resistance, ability to withstand constant flexing without fatigue and impermeability to gases and liquids, properties which seem to make it the ideal material to supersede rubber.

The inclusion of a sealed-in, nonextractable plasticizer in the compound guards this substance against the effects of air, water, sunlight, acid and alkaline solutions, and temperatures up to 250 deg. F., and as a result the compound retains its elasticity, resiliency, and flexibility, and it does not have rubber's tendency to oxidize or age.

♦ A new enlarged bibliography listing materials for teaching forest resources and conservation has just been published by the School Department of American Forest Products Industries, Inc.

The new edition describes and illustrates the three supplementary texts, forest map, forest products chart, series of four posters, and motion picture available to teachers upon request.

For information, address American Forest Products Industries, Inc., 1319 18th Street, N. W., Washington, D. C.

REAL MODELMAKING

Joseph P. Kleiber has spent a year of his spare time in building a working model of a microscope on a microscopic scale.

He is a Bausch & Lomb employee who has the job of assembling and adjusting microscopes.

Working at his home with watchmaker's lathe, taps, and dies, he began work on the little instrument which is only 2¾ in. high. The little stage, which carries the specimen, is ¾ in. square and can be racked in and out like a research model. It has a coarse and fine adjustment for focusing and an adjustment for interpupillary distance.

Real modelmaking

It is a binocular type microscope and has a revolving nosepiece carrying three objectives. The instrument is made entirely of brass.

HIGH SCHOOL STUDENTS PURCHASE AMBULANCE PLANE FOR NAVY

A Flying Ambulance was presented to the United States Navy by the Victory Corps of the Manhattan High School of Aviation Trades on June 23rd at 3:30 p.m. at Queensborough Playground, 59th and Sutton, New York City.

Piper HE–1 ambulance plane
— Official U. S. Navy Photograph

The money was accumulated from a "March of Pennies" drive and from the sale of scrap metal, rubber, old records, newspapers, etc. In this way the 3000 students of the largest vocational high school in the United States exclusively devoted to aviation, secured enough money to purchase this aircraft ambulance.

New Publications

Blueprint Reading at Work

By William W. Rogers and Paul L. Welton. Leatherette, looseleaf, 144 pages, 8⅓ by 10¾ in. Price, $1.28. Silver, Burdett and Co., New York, N. Y.

A text in which the subject matter on blueprint reading has been broken down into units in which are presented: three-view, two-view, one-view, sectional, auxiliary view, detail and assembly drawings.

Screw fastenings, gears, cams, welding practices, and sheet metal layouts also are discussed.

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Requires GOOD TOOLS
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STANLEY TOOLS
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Visual Teaching Aids and Project Plans at cost.
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DIVISION OF THE STANLEY WORKS
Educational Dept., New Britain, Conn.
1843 STANLEY 1943
FOR WOODWORKING AND FARM SHOPS
The most complete line offered by one manufacturer.
FOR ELECTRICAL SHOPS
Hammers, Bit Braces, Bit Extensions, Screw Drivers, etc.

Plastics from Farm and Forest

By E. F. Lougee. Cloth, 147 pages, 4¾ by 7 in. illustrated. Price, $2. Published by Plastics Industries Technical Institute, Los Angeles, Calif.

An exceedingly interesting story about plastics by a man who knows the subject. In it he discusses plastics from the very beginning and then brings the subject to date in his chapters on buttons and cloth from skim milk, and plastics from coal, oil, water and air.

Gas Welding Job Training Units

Prepared by the staff of Dunwoody Industrial Institute. Looseleaf, 92 pages, 8½ by 10¾ in. Price, $1.25. American Technical Society, Chicago, Ill.

A set of 28 jobs which are designed to give the learner an understanding of what industry demands, and an opportunity to acquire sufficient skill as a welder to enter the industrial world as a trade worker.

A set of check-up questions accompany each job, and a job check sheet answer book is provided.

Engineering Drawing

By Thomas E. French. Cloth, 622 pages, 6¾ by 9½ in., illustrated. Price, $3. The McGraw-Hill Book Co., New York, N. Y.

This is the sixth edition of this well known book on engineering drawing. The new chapters added present aircraft drawing, jig and fixture drawing, and welding drawing.

Shop Mathematics and Shop Theory

By John M. Amiss, G. Keith Shurtleff, and Hughitt G. Moltzau. Cloth, 190 pages, 5¾ by 8 in., illustrated. Price, $2. Harper & Brothers, Publishers, New York City and London.

Designed for apprentices, this book aims to make the mathematics and theory of machine-shop work as understandable as possible to the student.

It covers the preliminary mathematical processes, logarithms, geometry, trigonometry, and the applications of these to problems met in the shop.

Safety, fire protection, manufacturing methods, measuring instruments, cutting tools, heat treatments of metals, problems on the various types of gears and machine tools, also are discussed.

Problems requiring the use of handbooks also are included.

Occupational Study of Greater Kansas City Area

Compiled by Elizabeth K. Wilson and Richard A. Ball. Paper, 316 pages, 8½ by 11 in. Published by the executive committee, Occupational Study, Kansas City, Mo.

This is the first of two reports to be issued. The summaries presented are a compilation of information supplied by employers.

The material contained in these reports will be of great assistance to teachers in making their vocational guidance meaningful.

Methods of Measurement

By Wendell H. Cornetet. Paper, 135 pages, 6¾ by 10⅛ in., illustrated. Price, 80 cents. McKnight & McKnight, Bloomington, Ill.

A concise treatment on the use of measuring instruments such as rules, calipers, gauges, micrometers, etc. Also information on the measurement of density of liquids and solids, determining specific gravities, measuring tensile strength, determining specific heat of materials, and the like.

It's Fun To Make Things

By Martha Parkhill and Dorothy Spaeth. Cloth, 176 pages, 6¼ by 9¼ in., illustrated. Price, $2. Published by A. S. Barnes & Co., New York, N. Y.

Making something out of discarded, inexpensive articles, or out of materials collected from field or woods or stream, possesses fascination for almost everyone.

The book is full of suggestions on how to do this, and how to use paint, metal, wood, raffia, cloth, clay and cement, leather, and what-have-you, with the proper tools to transfer them into gifts, favors, and useful articles.

Analysis of Machine Shop Operations

By Donald F. Lane. Loose-leaf binding, 165 pages, 10 by 11½ in. Published by the National Foremen's Institute, Inc., New York, Chicago, and Deep River, Conn.

This manual for training apprentices and learners was made because the urgent needs of the times require that training be done in the shortest space of time and with the least amount of lost motion.

The manual is not a textbook but rather a guide of what is to be taught to the beginner.

Practical Perspective Drawing

By Philip J. Lawson. Cloth, 215 pages, 6¼ by 9½ in., illustrated. Price, $2.75. The McGraw-Hill Book Co., New York City.

The author has written this book so it may be used as a textbook by the student who is studying this subject; and as a reference book by the practical architectural draftsman, the artist in the advertising studio, and the commercial artist.

The basic principles are quite fully explained, then the problem of measurements, the cube, circle curves, and compound forms are elucidated, and finally applications of one- and three-point perspective are shown, together with methods for avoiding common errors, making the execution of a given job easier, and specific suggestions for doing work in a practical manner.

Aircraft Hydraulics

By Harold W. Adams. Cloth, 159 pages, 6¼ by 9¼ in. Price, $1.75. The McGraw-Hill Book Co., New York, N. Y.

This is a treatise on the principles, design,

(Continued on page 38A)

Shop Equipment News

New Products — Publications

JOINTERS WITH LONG TABLES AND FENCES

Accurate jointing of 25 to 50 per cent longer stock is permitted by the extra long tables provided with the new 6-in. jointer offered by Boice-Crane Co., 974 Central Ave., Toledo, Ohio.

The fence is 35 in. long. This length permits steady guiding and accurate cuts through the full length of even heavy 12-ft. doors and sash.

The new jointer is equipped with two-end fence locks, rear fence lock making the fence so rigid that even six times ordinary feed pressure cannot spring it.

The 2¾-in. diameter cutterhead has a 3-in. diameter cutting arc. The bearings and cutting head are designed to withstand speeds up to 5500 r.p.m.

The two-way pivot guard either completely covers cutting head or swings entirely below table

to permit rabbeting, thus making removal from the machine unnecessary.

Bench and floor types are offered in belted and motor drives.

For brief reference use IAVE — 910.

ALLIED RADIO RECEIVER KIT

Allied Radio Corporation offers a modern radio receiver kit especially developed for illustrating theory and practices now being covered in basic or preinduction radio training. It is available to all schools and colleges conducting war-training programs. This 5-tube kit permits progressive study of basic receiver subjects such as rectification, filtering, detection, RF, IF, and AF amplifications, etc. The kit consists of all necessary parts, wire, hardware, solder, tubes, and speaker for the construction of a 5-tube a.c.-d.c. design. Chassis is completely formed, punched, and rust proofed. The only tools needed for assembly are screw driver, pliers, and soldering iron. Circuit includes many outstanding features such as oscillator biased RF and IF stages, contact-potential biased audio stage, inverse feedback, automatic volume control, high capacity filtering, self-contained antenna and others. Write Allied Radio Corporation, Educational Division, 833 West Jackson Blvd., Chicago 7, Ill., for free descriptive material and circuit diagrams.

For brief reference use IAVE — 911.

THE DOALL INSTRUCTION GUIDE

The "Doall Instruction Guide," prepared by the Doall Trade School, contains a step-by-step program of Doall instruction, together with outlines of lectures, shop projects, grading guides, and illustrations of Doall training aids. The program of instruction is identical with that used by the U. S. Army Air Force of which the Doall Trade School is a technical training detachment.

The "Doall Instruction Guide" can be obtained free of charge by writing to the Doall Trade School, 1307 University Ave., S.E., Minneapolis, Minn. For instructors' use only, it will be necessary to make requests on school letterheads.

For brief reference use IAVE — 912.

CEMENTED-CARBIDE CUTTERS

The McKenna Metals Company, 305 Lloyd Avenue, Latrobe, Pa., announces its new descriptive catalog which is concerned exclusively with milling metals with cemented carbides. The new catalog describing Grayson-Kennametal milling cutters and applications is entitled, "Specialized Milling With Grayson-Kennametal Milling Cutters." A copy is available upon request to Latrobe, Pa., or any McKenna Metals district sales and engineering offices.

For brief reference use IAVE — 913.

KENNAMETAL CATALOG

McKenna Metals Co., 305 Lloyd Ave., Latrobe, Pa., announce their new Catalog 43B. Prices on all tools and blanks have been revised.

This catalog illustrates standard, nonstandard, and special tools, with diagrams showing clearance and rake angles, sizes of Kennametal tips

(Continued on page 38A)

TEACH PRECISION
with a PRECISION TOOL!

THE DUMORE GRINDER
IS BOTH A MEANS AND AN
EXAMPLE OF PRECISION WORKMANSHIP

War production is teaching industry many lessons which will lastingly affect both methods and products in the future. Out of the imperative need for the utmost precision in thousands of parts, came improved shop practices and a broadened application of grinding. Both have been facilitated by the versatility and easy adaptability of the Dumore Grinder. Mounted on any available machine tool for internal, external or surface grinding to accuracies of .0001", it makes high precision grinding possible in any shape, and provides invaluable training in the use and care of a precision tool.

Seven sizes and fifty-four quill combinations covering a broad range of applications, are described in detail in Catalog 42. Glad to send you a copy for the asking. The Dumore Company, Grinder Division, Racine, Wisconsin.

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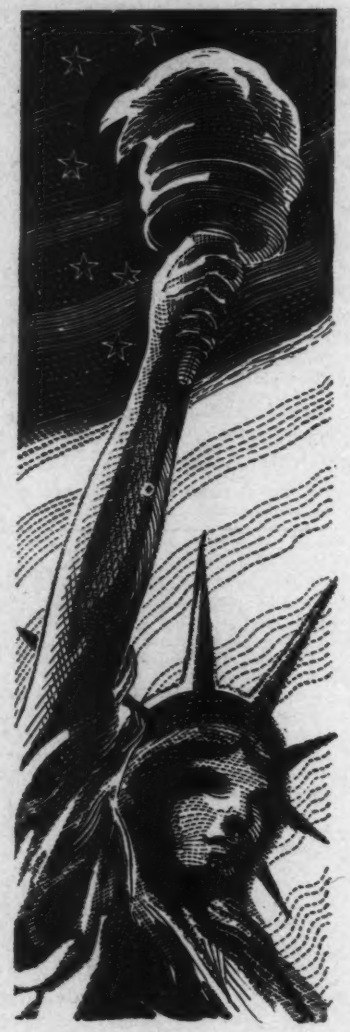
DUMORE PRECISION GRINDERS ARE SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN PRINCIPAL CITIES

The Girl They Left Behind Them



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Our new 1943-44 catalog lists a surprisingly comprehensive number of all these items — refer to it, and order all you need *now*. (If you haven't a copy, write or wire for one.)

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COST LESS . . . BECAUSE OF THEIR LONG-LIFE DEPENDABILITY!

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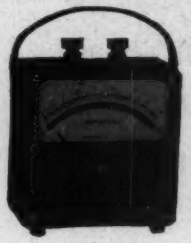
LABORATORY STANDARDS
Voltmeters, Ammeters, Wattmeters

STANDARD CELLS

WESTON *MODEL 430*



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Ideally suited for classroom instruction and student use because of their dependability, ruggedness and relatively low cost . . . features which have made the Model 430 line so universally preferred throughout industry. Have hand-calibrated mirror scales of long length, with large scale openings. Accuracy within ½ of 1%. Sturdy Bakelite cases give added protection in service. Extremely compact. Available in complete line of A-C and D-C instruments.

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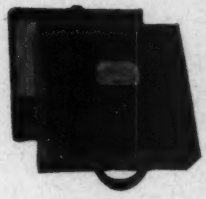

INDUSTRIAL CIRCUIT TESTER

A complete circuit tester for shop or laboratory. Has 27 voltage, current and resistance ranges (d-c voltage sensitivity 20,000 ohms per volt), for checking motor and control circuits, lighting circuits, sensitive relay circuits, communication circuits, etc., etc. Also available with compact resistance tester for checking insulation and cable covering resistance values up to 900 megohms.

WESTON ELECTRICAL INSTRUMENT CORPORATION, 595 Frelinghuysen Avenue, Newark, N. J.

(Continued from page 36A)

and shank dimensions, and operational illustrations showing proper use of tools. The book describes the standard and nonstandard tools made by this firm. It also contains general information concerning the origin and qualities of Kennametal, how to specify and order tools and blanks, proper use of chip breakers, grinding tools to avoid grinding cracks, brazing standard blanks to tool shanks, and Kenna-milling with tipped cutters of simple design. There are also illustrations of machining operations performed with Kennametal.

For brief reference use IAVE — 914.

PUBLICATIONS

(Continued from page 35A)

manufacture, installation, testing, and maintenance of aircraft hydraulic systems.

The presentation of the material is quite technical with many mathematical formulas, graphs, and diagrams to show how the flow of fluids plays its part in this necessary phase of aircraft handling.

The book is well illustrated, and the descriptions are clear and to the point.

National Defense Vocational Training for the War Production Industries

This is the annual report of the department of education of the division of vocational education, Baltimore, Md., for the period from July 1, 1941, to June 30, 1942.

It presents a general description of the program, together with a statistical and graphical presentation of how the work is organized and carried out.

There also are a number of pictorial views showing the learners in shop and classroom.

Precision Inspection — War Production Training

Prepared by The Washburne Curriculum Bureau, Washburne Trade School Press, Chicago, Ill. Paper, 95 pages, 8½ by 10¾ in., illustrated.

Compiled and edited by Claude H. Ewing, supervisor of vocational curriculum, and Richard B. Hill, assistant supervisor.

This book covers a review of mathematics (arithmetic, geometry, and trigonometry), and the use of measuring instruments such as: the steel rule, outside and inside calipers, caliper rule, protractor, micrometer, vernier instruments, depth gauges, precision gauge blocks, sine bars, and fixed gauges. The book shows how these various measuring devices are used in connection with making inspection measurements on threads, gears, conical pieces, angular pieces, and the like.

American Standard Definitions of Electrical Terms

Cloth, 311 pages, 7⅞ by 10⅞ in. Price, $1. Published by American Institute of Electrical Engineers, New York, N. Y.

A very useful set of definitions covering practically all phases of electricity. The work was inaugurated by the standards committee of the American Institute of Electrical Engineers and has the approval of the American Standards Association and the Canadian Engineering Standards Association.

The book represents an enormous piece of work and is the work of 18 subcommittees with a total personnel of about 120 men.

Vocational Education in the Hotel Business

Leatherette binding, 8½ by 14 in., 89 pages. A report to the American Hotel Association of the United States and Canada.

This report presents an analysis of the duties of hotel employees, how each employee is to be trained, the order of promotion in the various jobs, and the need for educating this type of help.

Fundamentals of Radio

By L. O. Gorder, Kenneth A. Hathaway, and Carl H. Dunlap. Cloth, 373 pages, 5¾ by 8½ in. Price, $2. American Technical Society, Chicago, Ill.

Written for those preparing for war service, this book covers the broad field of radio in a simple and direct manner. The book is well illustrated. A workbook to accompany this text also is available. The cost of the workbook is 50 cents.

The 24 chapters treat the subject about as follows: development of modern radio, radio symbols, principles of electricity and magnetism, resistance, a.c. and d.c. current, electrical measurements, inductance, condensers, capacitance, oscillatory circuits, resonance, tubes, amplifiers, acoustics, microphones, oscillators, transmitters and receivers, reproducing devices, power supply, and frequency modulation.

The book also contains a glossary of terms, and a collection of useful tables, formulas, and abbreviations.

1000 Preflight Problems

By W. H. Thompson and M. L. Aiken. Cloth, 176 pages. Price, $1.20; paper, 88 cents. Harper & Brothers, New York, N. Y.

A series of problems in the mathematics of aerodynamics and navigation for junior and senior high schools. Some of the formulas have been simplified and, the authors say, none require more mathematics than first-year algebra. Students are urged to use logarithms and the slide rule for speed. The book supplies tables of natural functions, logarithms, squares, etc. The authors have done a service to teachers and pupils in stating the principles and formulas, and in supplying the necessary problem material to complement and supplement any approved textbook.

Slide Rule Simplified

By Charles O. Harris. Cloth, 258 pages, 5¾ by 8½ in. Price, $2.50 ($3.50 with slide rule). American Technical Society, Chicago, Ill.

In these days, when the need of knowing how to use mathematics seemingly has been rediscovered, the conveniences offered by the slide rule ought to be emphasized by every teacher of mathematics.

The author presents a comprehensive treat-

(Continued on page 43A)

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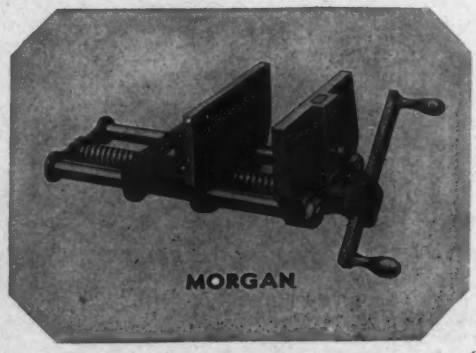
SCHOOL *to* SHOP

Morgan vises can be had in various sizes and styles, to meet every purpose. Write for literature and prices.



Morgan vises are the product of more than thirty years' experience in manufacturing better vises. They are protected by an unqualified guarantee.

Send for literature on our complete line of vises.

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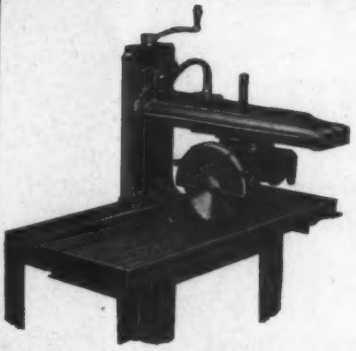
WALLACE
"MACHINE-OF-THE-MONTH"



No. 1
RADIAL SAW

Column, arm and motor rotate to any angle. Motor moves back and forth in arm for cross-cutting, angle-cutting and rip settings. Motors to 2 H.P. cutting up to 4" deep.

The Wallace No. 1 Radial Saw is the most versatile woodworking machine made! Does cross-cutting, angle cutting, compound angles, ripping, bevelling, rabbetting, shaping, routing and many other jobs.

This is the most practical saw made for teaching carpentry and cabinetmaking—thousands in industrial use.

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GET THEM STARTED WITH IT NOW

Be practical and far-sighted. In most any woodworking plant where your students obtain employment they'll find FRANKLIN GLUE . . . a tried and true friend. You'll note the advantages in your own shop, too.

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Girls are rapidly becoming an important factor in War industries, especially on production of intricate parts and pieces. Thousands of DI-ACRO machines are in use for such work. The ease of operation of DI-ACRO Units makes them ideal for use by girls.

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"Metal Duplicating Without Dies" describing Di-Acro Shears, Brakes and Benders and showing many parts which can be made.

TOP—Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches. CENTER — Di-Acro Brake forms angles, channels or "Vees".

BOTTOM — Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. All duplicated work is accurate to .001".

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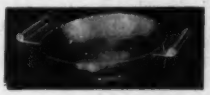

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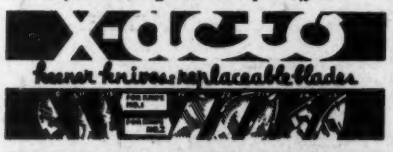

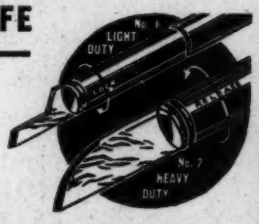

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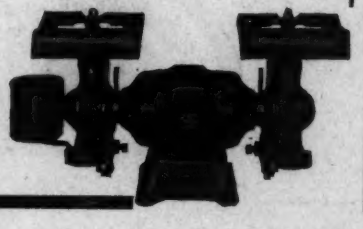

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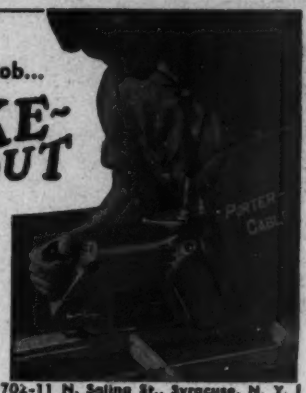

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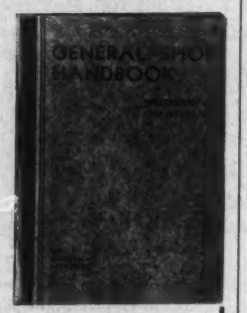

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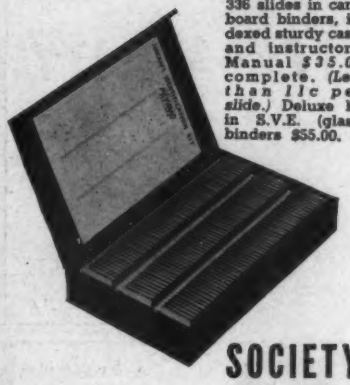

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Bruce Publishing Company ..... 3rd cover
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Carborundum Company, The 13A
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Chicago Wheel & Mfg. Co. 43A
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Columbian Vise & Mfg. Co. 33A
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Delta File Works 11A
Delta Mfg. Company 21A
Dick Company, A. B. 3A
Disston & Sons, Inc., Henry 27A
Dixon Crucible Co., Joseph 26A
Doall Company, The 4A
Dumore Company, The ..... 36A & 40A
Eisler Engineering Co. 44A
Engineering Sales Company 45A
Foley Lumber Company, T. A. 44A
Franklin Glue Company 40A
Gullow, Paul K. 42A
Hammett Company, J. L. 44A
Heller Bros. Company 22A
Higgins Ink Co., Inc. 45A
Hobart Brothers Company 45A
Jam Handy Organization, The 23A
Kempsmith Machine Company ..... 2nd cover
Kester Solder Company 10A
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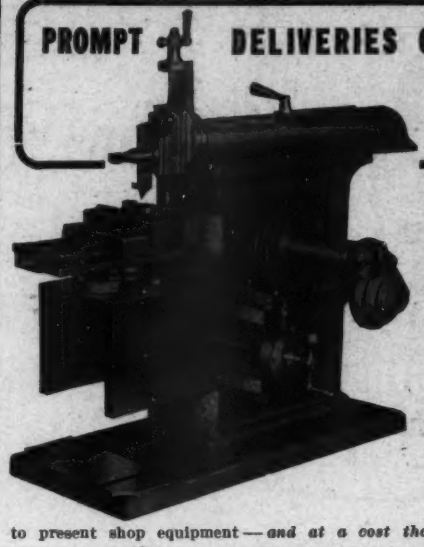

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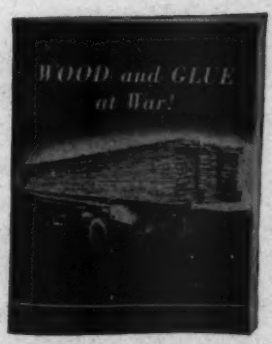

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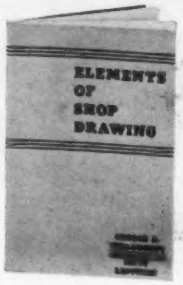

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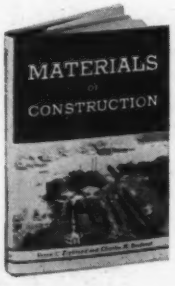

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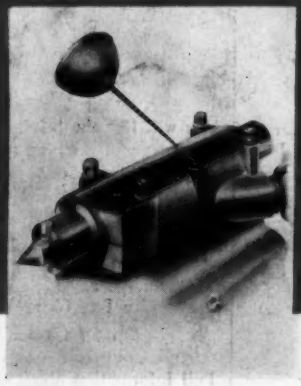
I've been building LeBlond Lathes for about 36 years now. I know that they're rugged and will put up with a certain amount of abuse. But this is no time for an operator to see how careless he can be. You young fellows who are maybe new at running a lathe—and you old hands who sometimes forget, have a listen to a guy who should know some of the tricks to "keep 'em turning."

First off, in setting up a new lathe *read your instruction book*. We put an awful lot of care into a LeBlond to get the accuracy shown on the inspection test card. But we might just as well spend our time fishing if you miss on getting it set up level. An ordinary carpenter's level won't do — it's not nearly sensitive enough. It takes a precision ground bulb level. You also want to use this instrument to check the alignment of the older machines from time to time.

After you are set up according to the book, study the lubrication chart. This is important. Look at the pictures below. These are the spots that need oiling every day.

Chester G. Ralston

Head Stock — Don't let oil level get below one inch from top of intake. Use a good grade of machine oil SAE 30.



Tailstock — This top unscrews. Keep the felt filtering pad saturated by daily oilings from a can.

Apron — Keep SAE 30 oil at a level where it can be seen at intake. Work plunger in and out slowly 3 or 4 times daily.

Feed Box — Keep the felt filtering pad in the trough saturated by daily oilings from a can.

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